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Scarcity, Mobility, and Conflict in Somalia: Climate Change and the Future of Transhumance in Galmudug and Hirshabelle States

Final Report

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Executive Summary

This executive summary provides an overview of the applied research project “Scarcity, Mobility, and Conflict in Somalia: Climate Change and the Future of Transhumance in Galmudug and Hirshabelle States." The study focuses on the effects of short- and long-term environmental changes and their impacts on the root causes and dynamics of violent conflict: (a) livelihoods; (b) migration and mobility; (c) armed group tactics; and (d) elite exploitation.

Climate change poses significant challenges to communities across Galmudug and Hirshabelle States, leading to resource scarcity, increased mobility, and conflicts over diminishing resources. Transhumance, the seasonal movement of herders with their livestock in search of pasture and water, has been a crucial strategy for sustainable livelihoods in the region. However, climate change-induced shifts in weather patterns and the availability of resources have disrupted this traditional practice, jeopardizing the livelihoods and resilience of pastoralist communities.

This research project is designed to inform programming situated in the Humanitarian-Development-Peace-Climate nexus. There is an urgent need for holistic, evidence-based programs that embrace the complexities of Somalia’s evolving poly-crisis, and avoid the incorporation of untested assumptions. It examines the drivers of conflict arising from resource scarcity, including competition over water and grazing lands which undoubtedly have impacts on the stability and security in both states.

Through a review of existing literature, the report identifies first trends and gaps in current research on the intricate relationship between climate change and conflict. It highlights twelve causal process observations (CPOs) that provide insights into the pathways involved (see 2. Literature Review). Employing a mixed-method approach (for detailed information, see 3. Methodology), the report analyzes the applicability of these CPOs in Galmudug and Hirshabelle, specifically exploring their relevance to the four pathways (see 4.1. Analysis of Climate-Conflict Pathways - Question #1) utilizing data from key informant interviews as well as a multi-linear OLS regression model based on data from Galmudug collected by IOM’s DTM unit.

The analysis yields several key findings, including:

- Traditional assumptions about the links between livelihoods and conflict may not hold in Galmudug and Hirshabelle. While it is generally accepted that climate change impacts livelihoods, our research suggests that reduced livelihoods are more indirectly linked to conflict. Specifically, we have not observed a direct causation where decreased livelihoods compel individuals to join armed groups. Furthermore, while our OLS multi-linear regression model indicates that while there is some degree of direct relationship between loss of livelihoods and conflict, with those who report losing livelihoods being 8.50% more likely to report engaging in disputes or conflict, this relationship is better explained through other mechanisms. The qualitative evidence further validates this, indicating that while a decline in livelihoods could contribute to instances of cattle raiding, actual conflict arises when preexisting clan tensions remain unresolved.

- Furthermore, our empirical analysis has shown that those facing reduced livelihoods from climate change adopt a number of adaptive strategies, with migration being one of the most important. This is particularly important for pastoralist communities seeking favorable conditions and income opportunities in urban areas. While migration may potentially contribute to an escalation of conflict, it also serves as a means of coping with the effects of climate change and escaping areas prone to conflict.

- There is evidence to support the notion that environmental changes can impact mobility patterns, which can subsequently result in resource competition, changes in clan composition, and shifts in power dynamics. These factors can trigger conflicts both within and between clans. Within our model, those reporting movement for livelihood-related reasons were 22.00% more likely to engage in conflict or disputes than those who did not. However, both our model and key informant interviews realize that these conflicts and disputes do not emerge from migration alone. Disputes primarily arise when negative perceptions persist between displaced communities and host communities, often due to unresolved grievances. The absence of clear land demarcation and effective conflict resolution mechanisms further amplifies the risk of competition for limited resources. Nevertheless, it is important to highlight that the report identifies several strategies for conflict mitigation. These strategies aim to foster positive relationships between clans and include the implementation of effective dispute-resolution mechanisms and the establishment of inter-clan agreements. By adopting such approaches, it is possible to mitigate conflicts and promote harmonious interactions among different clans.

- In general, our research findings challenge the validity of theories that link grievances to increased support for armed groups. For example, our model finds no statistically significant relationship between approval of the government and conflict. While support for armed groups in general is increasing this is not the case for non-state-aligned armed groups like Al-Shabab (AS), as is discussed in most literature on this topic. Rather, support for non-state actors like AS is decreasing against the backdrop of climate change while support for government-aligned groups like clan militias and the Somali Armed Forces (SAF) is increasing. This distinction is critical for the broader community of practice to consider outside of Hirshabelle and Galmudug, rather than assuming support for armed groups always means support for non-state-aligned actors. Our research also identified some evidence suggesting that armed groups, particularly AS, adapt their tactics in response to climate change, albeit not as part of a deliberate strategy.

- In the context of Somalia, elite exploitation emerges as a significant factor in understanding the impact of climate change. The competition for resources, driven by climate change, worsens existing social divisions and exacerbates tensions among marginalized clans and communities. This, in turn, fuels political rivalries and power struggles. The evidence presented in this report indicates that climate change not only intensifies political competition and marginalization but also enables elites to manipulate conflicts for their personal gain. As a result, there is an increased risk of conflicts arising from marginalization. At the same time, perceptions of community discrimination are some of the most influential variables in our model, both in its own right as well as part of the micro-mechanisms which make loss of livelihoods increase

the risk of conflict. These findings highlight the importance of addressing elite exploitation and promoting power-sharing settlements as crucial aspects and prerequisites for effective conflict mitigation and resolution strategies. To effectively address the underlying causes of conflict, it is essential to tackle the unequal distribution of resources and political power, ensuring that marginalized communities have a voice and stake in decision-making processes. By addressing these issues, efforts to mitigate and resolve conflicts can be more comprehensive and sustainable.

After conducting a thorough analysis and examination of the different Climate, Security, and Mobility (CSM) approaches in the context of Galmudug and Hirshabelle, we proceeded to explore existing recommendations for relevant strategies, policies, and programs that aim to address the complex interconnections between climate, security, and mobility in these regions. These recommendations were categorized into three key areas: conflict mitigation, climate change adaptation, and migration. We then conducted an analysis of these approaches based on the above findings, of which we have the following recommendations for stakeholders working in Galmudug and Hirshabelle:

1. National, state and district level conflict resolution and governance frameworks are critical to solving resource-based conflict in both states. Given our findings which indicate sentiments of marginalization and discrimination as drivers of conflict, more work should be put into developing effective strategies, policies and programs to enhance economic and political inclusion. Additionally, coming up with resource-management frameworks and agreements should be of utmost importance.

2. Climate change mitigation and adaptation strategies must work in tandem with effective conflict mediation and resolution. Without effective conflict mitigation, implementing climate change mitigation and adaptation programming is difficult.

3. Compared to conflict mitigation and climate change adaptation, there is a dearth of effective policies around how to deal with migration. This includes a lack of policies recognizing migration as a key adaptive strategy, and a lack of focus on how to deal with increasing urbanization. To this front, organizations should consider data-driven solutions and strategies to address the complex migration challenges facing

To effectively address the challenges of scarcity, mobility, and conflict in the context of climate change, a multidimensional approach is required. This approach should integrate social, economic, and environmental considerations. It is essential to refine the details of the implementation of these recommendations within Galmudug and Hirshabelle. This process would involve tailoring the strategies, policies, and programs to the specific needs and contexts of these states. By adopting a comprehensive and context-specific approach, it becomes possible to address the intricate dynamics between climate, security, mobility, and their impacts on the affected regions.

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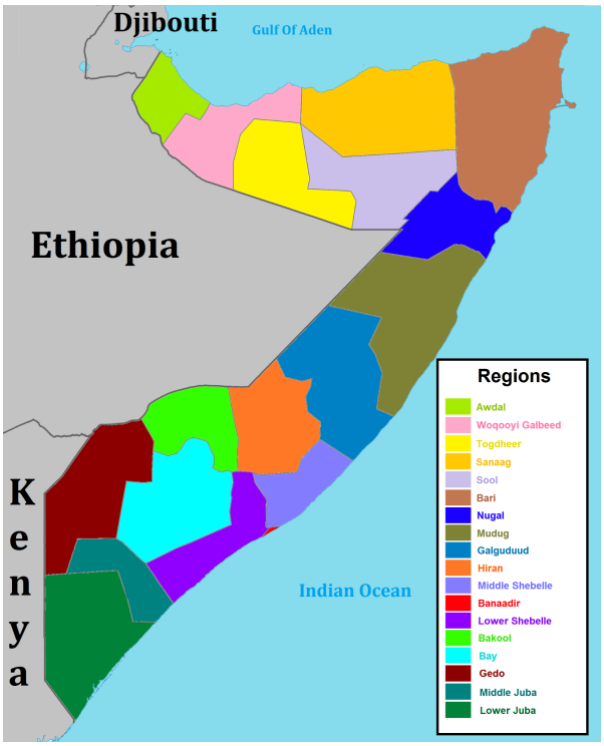
1. Introduction



The research project entitled “Scarcity, Mobility, and Conflict in Somalia: Climate Change and the Future of Transhumance in Galmudug and Hirshabelle States” is a collaborative effort between IOM Somalia and the Geneva Graduate Institute. This study aims to examine the interplay between environmental challenges, population mobility, and conflict dynamics in Somalia, with a specific focus on the impact of climate change on migration and conflict dynamics in Galmudug and Hirshabelle.

Somalia has suffered for many years from political instability and climate change, particularly as the current drought has resulted in five failed rainy seasons in a row. One of the most pressing issues facing the country is the increasing frequency and intensity of droughts, which contributed to cycles of famine and humanitarian crises, exacerbating the already fragile state of the country. This is particularly notable in Galmudug state, composed of Galguduud and Mudug, and Hirshabelle, composed of Hiran and Middle Shabelle, as seen on the map (‘A Map of Somalia Regions’ 2018). In Galmudug and Hirshabelle States, changing rainfall patterns have disrupted water availability and resulted in a range of secondary impacts that have had a detrimental effect on the states. Erratic rainfall, coupled with prolonged dry periods, affects crop yields and makes agricultural and pastoral activities challenging and unreliable (Sheikh 2017). These climate change impacts extend beyond the environmental realm and have socio-economic consequences. Against the backdrop of drought, both states have experienced increases in migration (SIPRI and NUPI 2022). Additionally, competition over scarce resources, including water and grazing lands, has escalated at times into disputes and violence between host and local communities, exacerbating conflicts and undermining stability (Sheikh, Galvanek, and Grimm 2019). The consequences of these conflicts are far-reaching, affecting the well-being and stability of the communities involved. They can lead to social fragmentation, economic disruptions, displacement, and loss of lives and livelihoods. Moreover, the strains placed on social cohesion and community relations can have long-lasting impacts, impeding development efforts and perpetuating cycles of violence and insecurity.

The interplay between scarcity, mobility, and conflict in the context of climate change poses significant challenges to the livelihoods and stability of communities in Galmudug and Hirshabelle States (Sheikh, Galvanek, and Grimm 2019). This research paper examines the complex relationship between climate change and conflict in these states, aiming to understand how these trends interact with and are influenced by livelihoods, migration patterns, armed group tactics, and the exploitation of climate change by political, economic,

and social elites and ultimately contributing to informed policy-making and sustainable development strategies in the region.

The research aims to address several key questions.

1. How do the climate change-security pathways play out in Hirshabelle & Galmudug States?
    a. What are the impacts of climate change on the livelihoods of the target communities, and how does this influence conflict dynamics?
    b. How does climate-induced migration impact conflict dynamics?
    c. How do the impacts of climate change affect the tactics and operations of armed groups, and how do the impacts of climate change impact the vulnerability of the population to armed group influence?
    d. How do political, economic and social elites take advantage of climate change impacts to consolidate power and further political objectives?
2. What are the most relevant short, medium and long term policy and programming recommendations that exist to address the climate-security-mobility nexus in the targeted communities?

We will answer these questions by employing a mixed-methods approach to provide valuable insights and recommendations for policymakers, practitioners, and stakeholders working to address the complex challenges faced by these communities. The report first examines the literature linking climate change and conflict, then it will lay out the methodology, followed by analysis of questions 1 and 2 and ultimately finishing with concluding observations, next steps and research gaps.

2. Literature Review

The dynamic between climate change and conflict is difficult to define. Many scholars agree that while there is a relationship, it is indirect and nonlinear in nature (Gleditsch 2012; Wischnath and Buhaug 2014; Theisen, Gleditsch, and Buhaug 2013). According to Scheffran, Link, and Schilling (2019), it is therefore important to consider pathways through which climate change and conflict interact with potential intervening variables such as dependency on rainfed agriculture, food prices, water scarcity, the human development index (HDI), existing road and water infrastructure, climate change vulnerability and adaptive capacity. Following this logic, a number of research frameworks have emerged exploring the pathways or assemblages between climatic change and conflict (Koubi 2019; Telford 2020).

In 2016, the Stockholm International Peace Research Institute (SIPRI) conducted a review of all literature in the climate-security nexus in East Africa and produced a framework laying out four distinct pathways through which climate and conflict interact. These pathways include: livelihoods, changing migration patterns, impacts on the considerations and operations of armed groups, and elite exploitation of local grievances. While other approaches – such as the Shared Socioeconomic Pathways approach, which is utilized to estimate socioeconomic impacts of climate change – exist, these frameworks assume the future does not include armed conflict and subsequent economic changes (Buhaug and Vestby 2019). The pathways approach utilized by SIPRI does not share this limitation – rather, it accounts for how climate change and socioeconomic impacts like conflict may be cyclical in nature.

Given its comparative advantage, this paper will utilize SIPRI's pathways to query how climate change and conflict interact in Hirshabelle and Galmudug states, and what this says about the overall validity of the pathways. To do this, we will utilize process tracing with mixed methods approaches to validate or invalidate the pathways. First, however, we conducted a literature review to identify the relevant causal process observations (CPOs) that must be proven or disproven. Then, we will explore what general policies have been proposed across relevant literature on geographies or issues of concern to Hirshabelle and Galmudug.

2.1. Climate-Conflict Pathways

2.1.1. Livelihoods

Climate change poses a major threat to Somalia. In 2017, the *CHILDFUND's* study revealed that "prolonged drought has destroyed an estimated 90% of livestock in drought-affected areas of Somalia" (ChildFund 2017). As a result, millions of livelihoods have been devastated, forcing people to leave their homes in search of food, water and resources. Experts predict that the situation will only worsen in the coming years (Abdirashid 2021). An article published by SIPRI explored the relationship between climate change and its impact on livelihoods and concluded that climate events, especially drought, have worsened the livelihoods of the population which may have subsequently increased conflict risks across the country (E. Krampe 2019)**.** This background produces the first CPO: ***CPO1: Climate change negatively impacts livelihoods.***

While the primary impact of climate change may be on the viability of pastoral or agricultural livelihoods, the reduction in the viability of these livelihoods results in a number of second order effects that may increase violence – including effects covered under other pathways and detailed in the sections below. Additional potential secondary and tertiary societal impacts include cattle price shocks, livestock raids, inter-communal tensions, and increased risk of gender-based violence (Maystadt and Ecker 2014, 1157–78; van Baalen and Mobjörk 2018, 561–62; Broek and Hodder 2022; Schilling, Opiyo, and Scheffran 2012, 1–16)). Furthermore, evidence indicates that these impacts are not felt equally across communities – and that national and subnational politics and policies can result in marginalized groups experiencing harsher climate change impacts compared to clans which have more power ((Eriksen and Lind 2009, 817–33). From this we find ***CPO3: Reduced livelihoods increase inter and intra-community conflict.***

This CPO plays out in multiple ways. To address climate change impacts and survive, vulnerable communities must select an adaptive strategy. According to a study conducted by Lwanga-Ntale and Owino (2020, 1–9) on Somalia, in times of natural disaster and drought these strategies tend to fall into three categories: social and organizational coping strategies, divesting of non-essential domestic assets, and diversification of income and food production strategies. Social and organizational strategies largely promote inter-communal and inter-ethnic harmony, as they rely upon drawing on community and networks to support oneself - these may include moving from climate-vulnerable areas to live with family members in places with more opportunities and stability (Lwanga-Ntale and Owino 2020). In the case of divesting non-essential assets and diversification of income and food production strategies, the literature generally indicates these behaviors as being more likely to result in conflict - such as engaging in cattle raiding or social unrest caused by livestock price shocks. In some cases

these strategies result, directly or indirectly, in conflict – such as when young men join armed groups to seek economic opportunity and support (Broek and Hodder 2022), which is a predominant CPO in the literature and provides us with ***CPO2: Reduced livelihoods result in increased support for armed groups***.

In Hirshabelle and Galmudug, this pathway is particularly relevant. Both areas are severely affected by the ongoing famine, with the latest Integrated Food Security Phase Classification (IPC) placing populations in Galgaduud and Mudug in a food catastrophe (FSNAU 2022). In addition, there are reports of livestock raiding and recruitment of men and children into armed groups (UNHCR and Norwegian Refugee Council 2022). However, the linkages between the intense famine and these broader conflict trends requires more investigation.

While there is a significant body of research in this space in East Africa, there are significant gaps in the research supporting the understanding of this pathway in Hirshabelle and Galmudug (van Baalen and Mobjörk 2018). This includes: geography, as there are currently no studies on this pathway focusing exclusively on either state, an over-emphasis on exploring how stress on livelihoods promotes conflict over how it could promote cooperation, and failing to account for power inequalities and how different clans or ethnic groups are impacted by climate change differently.

2.1.2. Migration

The question of how climate change affects migration and displacement, and whether it exacerbates violent conflict, has gained scientific and public interest in recent years (Hoffmann, Šedová, and Vinke 2021; Barnett and Adger 2007; Raleigh, Jordan, and Salehyan 2008; Brzoska and Fröhlich 2016; Scheffran 2012; Reuveny 2007; Burrows and Kinney 2016). In the context of climate change and violent conflict, the importance of migration and pastoral mobility patterns is often highlighted, although the relationship is very complex and the impact of climate change on migration is difficult to determine (Brzoska and Fröhlich 2016). The decision to migrate is the result of several factors, and it is rarely possible to determine the exact significance of climate change and environmental degradation as a cause of migration. This is particularly difficult given environmental changes influence the economic, social and political causes of migration (Reuveny 2007; van Baalen and Mobjörk 2018). Research shows that the pace of environmental change matters: while rapid-onset disasters such as floods lead to local displacement, the impact of slow-onset events, including drought, is more diffuse and linked to demographic and economic asymmetries (Barnett and Adger 2018). To understand the impact of climate-induced migration on violent conflicts, one must also consider the political, social and economic context (van Baalen and Mobjörk 2016).

A central assumption across the literature **(CPO4)** is that **climate change impacts mobility patterns, especially for pastoral communities.** As described in the previous section, climate change can increase the frequency of extreme weather events and disasters, threatening livelihoods or even survival. When environmental factors severely limit livelihood options, individuals have a number of adaptive strategies they may choose in response - one of which is migration (Broek and Hodder 2022). In Somalia, many livelihoods are based on livestock (60%) and subsistence farmers (23%) and are therefore dependent on rainfall for cultivation and cattle (Cortés Ferrandez 2020). Environmental change has rendered many traditional adaptive strategies obsolete and driven Somali people to migrate to areas where resources

are more available or there are alternative livelihoods to explore, such as urban areas (van Baalen and Mobjörk 2018, 559). For example, in Galmudug, clans often settle on the outskirts of towns and villages where they can access broader clan support networks and diversify their pastoralist activity with economic opportunities offered in urban centers (GIST Research Ltd. 2022).

As this example shows, climate-related disasters specifically impact the livelihoods and migrations of nomadic pastoralists, who are traditionally constantly on the move and comprise more than half of Somalia's population. Their livelihood strategy has evolved over centuries and involves mobility being key to survival in harsh environments. “However, with the acceleration of climate change, the availability of pasture and water has become more unpredictable, forcing pastoralists to change their traditional grazing routes” (van Baalen and Mobjörk 2018). Hence, migration and altering pastoral mobility patterns represents an adaptation strategy for groups whose livelihoods are threatened by the impacts of climate change.(Adger et al. 2014; Scheffran 2012)

The literature also indicates that **changing mobility patterns results in increased conflict (CPO 5).** Changing pastoral mobility can fuel tensions with host communities and increase the risk of community-based violence (Reuveny 2007). In East Africa, one modality through which this could occur is through resource competition in receiving areas (Rigaud et al. 2018). When herders move cattle to areas that are richer in water and pasture, they end up closer to other groups and may compete over shared resources or become more vulnerable to attacks by hostile groups (van Baalen and Mobjörk 2018, 560; Leff 2009). As discussed above, local power dynamics and access to resources in Somalia is largely clan-based. Displacement and the influx of new groups can change the clan and power composition in the host community and thus threaten the control of the dominant groups, which can lead to inter-community conflicts (Eklöw and Krampe 2019; Broek and Hodder 2022).

However, the risk of violent conflicts depends on the social, political and economic factors in receiving areas, including the attitude toward incoming migrants and the frequent absence of traditional mechanisms for dispute resolution (Mobjörk, Krampe, and Tarif 2020). It has therefore been argued that the arrival of new groups and confrontation with them, combined with the frequent absence of customary conflict resolution institutions are likely to increase the risk of violent conflict (De Juan 2015). The traditional approach to dispute resolution in Somalia, *xeer*, survived colonization and state collapse, but has been weakened or replaced partly because of the civil war, and also because of conflict and climate-induced migration of traditional mediators, such as elders and local experts of customary law (Eklöw and Krampe 2019). Nevertheless, in Galmudug clans have implemented a range of mitigation strategies to avoid clashes while seeking new pastureland. For example, they use traditional treaties, inter-clan dialogue or they try to inform members of other clans about security conditions before traveling (GIST Research Ltd. 2022).

Lastly, the literature proposes that internally displaced persons **(IDP) camps are hot spots for armed group recruitment and conflict (CPO 6).** Within IDP camps themselves, the conditions for violent conflict can arise. Somalia has some of the highest numbers of IDPs in the world. In February 2023, UNOCHA estimated 3.86 million people to be internally displaced - a number that is only projected to rise amidst the drought (UNOCHA 2023). IDP sites are hotspots for conflict among and between clans and landowners (Eklöw and Krampe 2019).

Moreover, in IDP camps, people can become targets for recruitment by armed groups such as Al-Shabaab (AS). IDPs often depend on their clan affiliations for protection and access to social services. However, when they relocate outside the reach of their own clans and subsequently lose access to vital services and a sense of social cohesion it is easier for armed groups to gain trust and target potential recruits. Children are also often targets for armed group recruitment, as parents are less available to protect them and children in IDP camps have less access to education and employment opportunities (Broek and Hodder 2022). In 2018, Somalia had the highest level globally of children recruited and used in armed conflicts (Eklöw and Krampe 2019).

While the climate-migration-conflict nexus has been extensively researched, with increasing focus on changing pastoral mobility patterns, particularly in West and East Africa, there are still significant gaps in the literature. Somalia and especially Galmudug and Hirshabelle states have rarely been included in such studies. The extent to which clan structures influence the risk of conflict between newly arriving communities and host communities and the role that inter-clan dialogues or other mitigation tools might play should be further explored.

2.1.3. Armed Groups

Climate change does not just impact civilians and governments, but also influences the dynamics of ongoing armed conflict. This pathway explores how armed groups take advantage of climatic conditions for their own benefit (van Baalen and Mobjörk 2018). The research in this space can generally be divided into two themes: how climate change facilitates the rise of armed groups and how these armed groups leverage fragile environments for their operations and tactics.

Climate change can facilitate the rise of armed groups through recruitment, particularly as vulnerable individuals seek alternatives to dwindling livelihoods as discussed under CPO2 above. For example, more than 60% of community leaders surveyed in Nigeria by the United Nations University's Managing Exits from Armed Conflict division indicated they knew of someone who had joined an armed group due to livelihoods lost from climate change (Caus 2021). Climate change can also facilitate the rise of armed groups by **aggravating inter-group grievances and community grievances with the government (CPO7)** which armed groups can capitalize on – although the literature on this is divided. Some authors discuss how state failure to effectively respond to disasters **negatively impacts state legitimacy and provides armed groups with an opportunity to take advantage (CPO8)** (Hendrix and Salehyan 2012, 3–5). Others like De Juan and Hänze indicate that climate change-driven resource scarcity actually increases social cohesion between groups except in situations where the negative impacts are born unequally (De Juan and Hänze 2021). While this narrative is increasingly featured in academic articles and political speeches, most of the evidence supporting this claim is anecdotal (*United Nations* 2021). Some researchers doubt the importance of these factors on the influence of armed groups overall – Ide and Brzoska indicate that while these mechanisms may exist climate change has a greater impact on armed group operations than on community grievances (Ide et al. 2020).

Climate change can also impact the exact timing, location, and motivation for attacks by armed groups (CPO9). In particular, these decisions are influenced by rainfall and vegetation cover. For example, Detges describes that in northern Kenya pastoralist violence

occurs closer to well sites and in locations of higher rainfall, where vegetation provides better cover for attacks (Detges 2014). However, the exact relationship between vegetation, rainfall and attacks does not have consensus – some research has found that dryer years result in less violence than normal, other researchers believe the opposite, and another group still believes that precipitation change in general whether dryer or wetter drives conflict (Theisen 2012; Ember et al. 2014; Raleigh and Kniveton 2012). While there is no consensus on the exact nature of rain or vegetation variability and rates of conflict, there is more agreement that the motivations behind these attacks are driven by opportunism rather than desperation (Theisen 2012; Ide et al. 2020). Beyond timing, locations and motivations, climate change can provide armed groups with additional leverage to use the environment as a weapon. For example, in Nigeria the military has accused Boko Haram of poisoning water in areas under severe water scarcity (Nett and Rüttinger 2016).

In Hirshabelle and Galmudug, it is particularly important to explore this pathway and potentially expand upon its existing interpretation in literature. In general, the literature above assumes theoretically that climate change increases conflict by increasing the strength of armed groups or the support of local communities for armed groups. However, in Hirshabelle and Galmudug it seems that climatic conditions are increasing conflict by increasing local resistance to AS. GIST research from October 2022 identified that Sinandaqo, Miir-Dugul, Hiindere and Orshe in Galmudug are currently under AS control and that AS is present in areas such as the south of Baxdo. This presence ultimately means that transhumant groups inevitably run into AS. There are reports of AS exploiting the current climate stress in these regions by seizing already limited herds and seeking to extort taxes - which has resulted in violence between herders and AS (GIST Research Ltd. 2022). Less information is available on these dynamics in Hirshabelle, the latest trends show that clan militias are uprising against AS in protest against the aforementioned taxation policies (Khalil and Zeuthen 2023).

While there is significant research on tactics and operations of armed groups in contexts impacted by climate change, and there is research exploring how climate change can impact communities, there has not been an extensive exploration of how climate change may actually decrease support for armed groups. This feeds into a broader gap in climate-security literature - wherein the literature generally tests theories assuming conflict will happen, and neglects to explore cooperation. Hirshabelle and Galmudug could potentially provide an opportunity to expand this pathway beyond its current interpretation - and further diversify the academic understanding of the pathway through which climate change and armed groups interact.

2.1.4. Elite exploitation

In the midst of environmental degradation and resource scarcity, local and national elites manipulate natural disasters and local struggles to consolidate control over resources to the expense of weaker groups (SIPRI and NUPI 2022). The term elites is used in the literature to refer to individuals or groups with relative wealth, privilege, power and influence. In Somalia, local elites have looted and targeted livestock and food stores in minority communities during famines (Majid and McDowell 2012). Literature has further illustrated the importance of land governance and tenure rights as sources of contestation (von Uexkull and Pettersson 2018). Climate change leads to a reduction of cultivable land and an increase in local competition for tenure rights. The lack of a clear land-governance system and regulations in Somalia has further exacerbated the problem around resource scarcity and led to it becoming a potential

driver of violent conflicts. For example, flooding led to weaker minority clans being evicted from their land which was then seized by more powerful clan elites when the water retreated (Eklöw and Krampe 2019, 22). This background produces ***CPO 10: Climate change increases political competition and intensifies marginalization.***

Elites might also exploit vulnerable populations for political purposes to strengthen their own agenda, such as through the manipulation of clan relations (Eklöw and Krampe 2019). Local disputes or resource conflicts constitute situations that can easily be manipulated by elites as they can capitalize on existing grievances and tensions (van Baalen and Mobjörk 2016). Hence, while previous sections discussed how climate change and resource scarcity can increase the risk of local conflict, in particular disputes between different clans in Somalia, this final pathway identified by SIPRI addresses the question of how **low-intensity conflicts between communal groups can be manipulated and politicized by elites and escalate into broader conflicts (CPO 11)** (van Baalen and Mobjörk 2016)**.**

During their field mission to Galmudug and Hirshabelle in 2019, the Berghof Foundation identified disputes over land ownership and borders, such as farmland, to be the most common cause of conflict. In particular, the lack of documentation on ownership and improper demarcation means different clans interpret land ownership differently. Similar conflicts might arise from competition over scarce pasture and water, especially during the drought season (Sheikh 2017; Sheikh, Galvanek, and Grimm 2019). These examples illustrate that local governance can be an intervening factor in the path from climate change to elite exploitation to conflict. In Somalia, the lack of government presence, or the unequal distribution of power between clans increases the risk of conflict.

Thus, as the literature shows, it is not only manipulation by elites that can lead to the escalation of violent conflicts. Closely related, yet important to mention, mismanagement and unequal distribution also play a crucial role (Thalheimer and Webersik 2020). Elite competition for resources can lead to deep feelings of societal marginalization and exclusion - including views that one group is treated unequally or unfairly (Douma 2006). There is a growing body of literature around perceptions of inequality and conflict, which indicates that perceived inequality between groups can increase the likelihood of conflict when it is perceived along group lines and sufficient motivation exists (Must 2016). Accordingly we have **CPO12: Marginalization produced by elite competition can increase the risk of conflict.**

This pathway accentuates the importance of accounting how climate-related environmental changes interact with political processes. In the case of Somalia, it highlights how communities are more susceptible to elite exploitation in the wake of absent or weak state institutions. The pathway highlights the “need for incorporation of the potential roles that elites can play in climate- exposed and conflict-affected regions” (Mobjörk, Krampe, and Tarif 2020).

2.2. Policies along the pathways

Across the pathways, there are four general themes of policy recommendations to address the specific dynamics through which climate change can influence conflict. The first bucket is strengthening local institutions by building infrastructure or supporting effective natural resource management and disaster risk reduction strategies (Nett and Rüttinger 2016; F. Krampe 2017). The second bucket is the diversification of livelihoods – through promoting less

water-intensive and less climate sensitive livelihoods, creating climate risk insurance schemes, and integrating gender sensitivity (Caus 2021; Nett and Rüttinger 2016; Broek and Hodder 2022). The third bucket emphasizes that peacebuilding programming must be climate sensitive – and that climate change adaptation and mitigation programming must be conflict sensitive (Nett and Rüttinger 2016). The last bucket of recommendations focuses on increasing the capacity of citizens and civil society to advocate local government to effectively respond to climate pressures (F. Krampe 2017). While there is a great breadth of policy recommendations and research, there is limited understanding on the efficacy or relevance of these policies to Hirshabelle and Galmudug. Similarly, there has been limited analysis undertaken on how policies affecting land tenure, disaster response, conflict mitigation and nature resource management interact with the pathways, in part because there is limited desk research available providing analysis of these policies from the Federal Government of Somalia, let alone any state or district-level policies.

2.3. Identified Trends and Gaps

Research in the climate-security nexus has significant gaps– it focuses too much and too often at country-level, over-emphasizes the onset of conflict rather than escalation, duration, or diffusion, and over-assumes that all people in a given study are equally impacted by climate change without consideration for social status or livelihood activities (von Uexkull and Pettersson 2018). Of particular relevance to this research is the fact that studies on the climate-security nexus in East Africa pay too little attention to the context of Somalia. Most of them do not include Somalia nationally, let alone analyze the issues at a state or district level. This is a significant gap because Somalia is one of the most demonstrable examples of a country with active, evolving subnational conflicts that has faced significant exposure to climate change.

Accordingly, the existing research has significant gaps that this paper will seek to fill in order to further elaborate and explore in the context of Hirshabelle and Galmudug states. Additionally, while there are a number of policy recommendations that exist, there is limited analysis on the relevance of these policies in general, especially in Hirshabelle and Galmudug. Accordingly, this research will fill a number of gaps and help affirm and expand the general understanding of the climate-conflict nexus.

3. Methodology

The study utilized a mixed methods approach to provide a context-specific understanding of the climate-conflict pathways and relevant strategies, policies and programs in our target geographies. The within-case study was conducted remotely but focused on Hirshabelle in south central Somalia and Galmudug in central Somalia, which have been identified as relevant because of the prevalence of conflict and their sensitivity to climate change. The focus of this research is two fold: first, to expand and update the understanding of the climate change and conflict nexus, utilizing new data and qualitative research to validate or invalidate the CPOs identified in the literature that link climate change to conflict. Second, to explore what policies could be most effective to address identified challenges and promote resilience to climate change and conflict in both states. As a reminder, our research questions are:

1. *How do the climate-security pathways play out in Hirshabelle & Galmudug State?*

2. *What are the most relevant strategies, policies and programs that exist to address the climate-security-mobility nexus in the targeted communities?*

3.1. Data sources

3.1.1. Data sources for Question #1

Under research question #1, we used quantitative and qualitative data. The qualitative data was collected through eight key informant interviews (KII) and supplemental desk research. Interviewees are anonymous, but included experts such as ministry members, technical experts, academics and policymakers familiar with the subject matter in Galmudug and Hirshabelle. The interviews were conducted remotely via Zoom or Webex and according to the Chatham House rule, which allows the information obtained to be used without revealing the identity or affiliation of the interviewee.

The quantitative data is based on a survey finalized by IOM Somalia in May 2023. The District Profiling Household Assessment was conducted across five districts in Galmudug State (Cabuudwaq, Dhuusamarreeb, Gaalkayco, Hobyo, and Cadaado), with the data coming from a statistically representative sample of each district. The assessment was based on a quantitative household survey instrument that includes questions on household characteristics, livelihoods, pastoralism and agriculture, environmental degradation, food and nutrition, WASH, social cohesion, migration and movement intentions, and access to services and taxes. In total, this produced 1,560 responses of cross-sectional data.

As identified above, our primary motivation under question 1 is to explore the pathways between climate change impacts and conflict. Given the significant exposure of Somalia to both climate change and conflict, it is difficult to formulate a model which statistically validates the linkages between climate change and secondary impacts like reductions in livelihoods with conflict. Accordingly, we decided to focus on the secondary impact of climate change and their relationship with conflict through a regression model, while we use qualitative data to further validate the linkages between things like climate change and livelihoods. We ran two models with two different dependent variables: one which measured reports of participation in disputes or conflict in a household in the past year, and a second measuring household reports of injury

or death due to violence or conflict in the past year. In each case we created dummy variables for the dependent variables.

We utilized the following independent variables based on our research and the data available from the District Profiling Assessment:

Variable	**Justification**
Reduced livelihoods	Based on the literature review in the livelihoods pathway, reductions in livelihoods are associated with an increase in conflict. Given that the dominant form of economic activity in Galmudug is pastoral, we use reports of having fewer animals in the past five years as an indicator.
Moving for livelihood-related reasons	Based on the literature review in the mobilities pathway, moving for livelihood related reasons (or movement in general) is generally expected to be associated with increases in reports of conflict. Accordingly we will use this indicator of moving for livelihood related reasons, which is even more appropriate given the specific links the literature normally specifies movements to be for livelihood-related reasons.
Government approval	There is significant literature recognizing the role of grievances against the government and conflict, recognizing that service delivery in particular can be a key indicator of conflict particularly when combined with other factors such as inequality (De Juan and Wegner 2019). Accordingly, we will explore this in relationship to other variables in the model as well as its relationship with conflict directly.
Perceptions of community discrimination	Literature generally recognizes the linkages between perceived inequality and conflict (Must 2016), particularly when these linkages fall along inter-group lines. Recognizing that literature above indicates insufficient research on the role of inequality in conflict-climate dynamics, we included this variable to explore its relevance. Particularly, literature recognizes that sentiments of community discrimination as results of elite competition, which is relevant for our research to understand (Douma 2006).
Geography	We include this variable as a pseudo-fixed effect for geography, which could have an impact on conflict given the ongoing impacts against Al-Shabaab. Given the geographic variations in these conflicts, geography is an important factor to control for.
Change in weather	While changing weather provides direct impacts on most of these variables, it is also an important potential variable itself. For example, a number of studies indicate that increasing temperatures may increase the propensity to engage in interpersonal violence directly by increasing irritation and anger (Chersich et al. 2019). This allows an exploration of these direct impacts, as well as accounts for any direct relationship

	between climate change and conflict.
Household status	In addition to the pathways indicating that IDP-host community conflicts may be one mechanism through which migration produced by climate change leads to conflict, literature has often explored how IDPs may be more likely to engage in violence due to lack of access to livelihoods or other resources among other reasons (Bohnet, Cottier, and Hug 2018). Thus, we will include this factor to control for household status and explore its potential relationship with other variables.
Female freedom of movement	Research has recognized the links between gender, climate change and conflict, usually noting a relationship between gender and conflict in environments where climate change is occurring due to the vulnerability of these women to climate change impacts due to their gender roles (Omolo 2011). For example, women are often in a position of having to retrieve water, and increasing water scarcity often requires women to walk further and further distances through more dangerous places to retrieve water. Recognizing this intersection, we included this as a relevant variable.
Income	There exists significant research on the relationship between income and conflict, particularly recognizing that poorer households may be more likely to support armed groups and may be more at risk of engaging in violence (Justino 2009). By contrast, an increased amount of income may indicate elite status, for which there is a considerable body of literature recognizing the propensity of elites utilizing violence and conflict to protect their wealth (van Baalen and Mobjörk 2018) Accordingly, income amount is recognized as a control variable.
Number of times displaced	As identified above, there is some literature on the role of displacement in driving conflict (Bohnet, Cottier, and Hug 2018). In addition, research recognizes that a history of conflict may be one of the most influential factors for increasing conflict risk in environments impacted by climate change (Mach et al. 2019). Thus, we've included the number of times someone has been displaced to account for these factors.

The majority of the independent variables were also created as dummies, with exceptions being government approval, which was a categorical variable, and income and number of times forcibly displaced, which are continuous variables. However, to create a more normal distribution in the variable we took the square root of the income variable which reduced the right-skew. Specific details on the coding of the variables can be found in **Annex A: Quantitative Analysis.**

3.1.2. Data sources for Question #2

For research question #2, we applied the methodology for a scoping study defined by Arksey and O'Malley (Arksey and O'Malley 2005). This first entailed creating a list of criteria to identify

the total population of policy papers, academic articles and other documents to be included. These criteria included:

- Published in the last 5 years (no later than May 2018)
- Focused on countries in the Horn of Africa (Ethiopia, Somalia, Eritrea, Kenya, South Sudan, Djibouti, Sudan)
- English language
- Exclusion of studies or documents that focus on global-level or continent-level issues and recommendations
- Included key words such as climate change, conflict, natural resource management and land tenure.

Utilizing these criteria, we searched the websites of IOM, UN Migration, UNDP, UNEP, FAO, WFP, UNHCR, UNICEF, the Heritage Institute, ISS-Africa, the Rift Valley Institute, and the Horn Institute for Strategic Studies. We also conducted a search of Google Scholar, where we reviewed studies that showed up on the first page of the search as most relevant for the key terms and also pulled the most relevant studies from the references of these articles. This generated a total population of 104 documents that fit the inclusion and exclusion criteria. Once identified, we further refined the inclusion and exclusion criteria to include that the document needed to have a recommendations section and it needed to be about a topic that was relevant to Galmudug and Hirshabelle. Following this, we had a shortlist of 41 documents which we utilized in the charting process.

3.2. Analysis

3.2.1. Analysis for Question #1

a. Qualitative Analysis

To answer the first research question (and sub-questions), namely the impact of climate change on conflicts in Somalia along the four pathways mentioned above, we utilized a process tracing methodology, coined by Bennett and George (1997). Utilizing this methodology, we first conducted a literature review as identified above to select the key causal process observations (CPOs) behind the pathways. Following the conduct of our key informant interviews, we anonymized and analyzed responses to determine evidence for or against each CPO in conjunction with evidence from additional desk research and the quantitative analysis. When this analysis was done, we categorized the validity of each CPO according to the table below:

Rating	**Definition**
Validated	CPO is fully affirmed, all others rejected.

Mostly Validated	CPO is confirmed based on evidence for it, but other hypotheses exist that at minimum are relevant.
Somewhat Validated	CPO is affirmed to be relevant (i.e. there is some degree of evidence supporting the hypothesis), but there is not enough evidence to fully confirm it.
Inconclusive	There is not sufficient evidence for or against the causal pathway to make a determination.
Somewhat Invalidated	There is evidence against the CPO (i.e. some degree of evidence questioning the relevance of the hypothesis) but not enough to fully eliminate it. There may be some evidence for it, but it is weaker than the evidence against it.
Mostly invalidated	There is compelling evidence against the CPO and little to no evidence for it. A viable alternative may or may not exist.
Invalidated	CPO is fully eliminated, another, valid alternative hypothesis exists.

b. Quantitative Analysis

A breakdown of the full analysis is included in **Annex A: Quantitative Analysis**. Generally speaking, we conducted a multi-linear ordinary least squares (OLS) regression to explore the correlations between various independent variables associated with our CPOs and potential conflict or conflict-related variables. Using OLS has several advantages: it is widely used and well established, the coefficients it produces are easily interpretable, and when assumptions are met it provides the most efficient and unbiased estimators of parameters. For us, this means it allows us to draw more accurate conclusions about individuals and households across Galmudug based on the sample. Additionally, OLS has the advantage of achieving efficiency when samples are sufficiently large, which mitigates concerns around reliability when standard errors have a non-normal distribution.

The findings from this study were then explored alongside qualitative data collected with interviews and desk research to determine the validity of various CPOs. We also utilized descriptive statistics to pull pieces of evidence for or against our CPOs in research question#1.

In general, we utilized quantitative analysis as a "hoop" test - meaning that the presence of a certain result does not fully validate a theory but represents an assumption we would make that must be true for the theory to have any possibility of being true. Utilizing our models, we formulated the following hypotheses. These hypotheses are broken down into mathematical form in Annex A.

CPO3: Reduced livelihoods increases inter and intra-community conflict
Hypothesis: **If** a respondent reports their household having reduced livelihoods, **then** these households will be more likely to report conflict or injury than households who do not report reduced livelihoods.

CPO5: Changing mobility patterns result in increased inter-clan conflict
Hypothesis: **If** a respondent reports moving for livelihood related reasons, **then** these households are more likely to report conflict or injury and death than households who do not report moving for livelihoods.

CPO8: Grievances vs the "state"/"the government" increase support for armed groups
Hypothesis: **If** a respondent reports higher levels of government approval, **then** they will be less likely to report that their household engaged in conflict or disputes.

CPO12: Marginalization produced by political competition increases the risk of conflict.
Hypothesis: **If** a respondent reports perceptions of community discrimination, **then** they will be more likely to report disputes and conflict or injury and death.

Given that our dependent variables are dummy variables, the models utilized are linear probability models where the probability of the dependent variable occurring is expressed in terms of percentage points based on the independent variable. For example, the results may be expressed as "those expressing feelings of community discrimination are X% more likely to report their household engaged in conflicts or disputes than those who did not express perceptions of community discrimination."

The specific models we utilized can be expressed as follows, where $\beta 0$ is the intercept and u is the error term.

Model 1:

$$\widehat{conflict} = \beta 0 + change\ in\ weather + reduced\ livelihoods + government\ approval + perceptions\ of\ community\ discrimination + household\ status + moving\ for\ livelihood - related\ reasons + female\ freedom\ of\ movement + number\ of\ times\ forcibly\ displaced + geography + income + u$$

Model 2:

$$\widehat{injury} = \beta 0 + change\ in\ weather + reduced\ livelihoods + government\ approval + perceptions\ of\ community\ discrimination + household\ status + moving\ for\ livelihood - related\ reasons + female\ freedom\ of\ movement + number\ of\ times\ forcibly\ displaced + geography + income + u$$

In running these models, we must account for a few weaknesses of linear probability models in general. First, linear probability models always entail heteroskedasticity. To compensate for this, we ran the model with robust standard errors. Second, standard errors are non-normal in a linear probability model. For us, this is the advantage of utilizing OLS, as the asymptotic efficiency allows us to still draw conclusions from this model given that our sample is sufficiently large (at n = 1560). Thus, we can confirm that our model meets all necessary assumptions to be an unbiased and a reliable estimator.

3.2.2. Analysis for Question #2

Under question two, we took the shortlisted documents and conducted a content analysis of the data via a charting process. This data charting included the following factors:

- Key words and phrases: For each recommendation we pulled keywords, which allowed us to analyze trends across all recommendations and themes. These include phrases like: "climate change adaptation", "conflict prevention and mitigation", "governance", "resource management", "awareness raising", "resource allocation" and others.

- Relevance of the policy in question, as evidenced by the feasibility of the policy recommendation, its applicability to the climate and environment of Hirshabelle and Galmudug, and its appropriateness to the climate change, conflict and migration challenges faced in Hirshabelle and Galmudug. This was assessed in a system whereby each recommendation was rated on a scale of three points, with 1 or less being scored as not relevant, 2 being scored as relevant and 3 being scored as most relevant. The scoring system was as follows:

    - Appropriateness to the climate/environment of Galmudug/Hirshabelle (1 point)

    - Applicability to the migration, conflict, and climate change issues faced in Galmudug/Hirshabelle (1 point)

    - Feasibility, or if the strategy or policy is something that could be reasonably achieved (and not, say, something as ambitious as “world peace”) (1 point)

- Specificity of the recommendation: For each recommendation, we scored it as “specific” or “not specific” depending on the details of the recommendation. A strategy with the phrasing of “mitigate conflict” for example would not be specific, while “ensure an effective national reconciliation process” would be considered specific.

- Type: Each recommendation was identified as either a strategy, policy or program. This allowed classification so that the recommendations could be placed into a framework.

- Category: Each recommendation was given a category depending on what it covered - this included conflict mitigation, IO operations, sustainable livelihoods and others. This categorization allowed us to analyze policies along groups and determine how best to group the most relevant policies in the framework.

As a result, a total of 294 strategy, policy, and program recommendations were generated. To refine the list, we applied a filtering process and identified the relevant and most pertinent recommendations. These selected recommendations were then categorized into three main sections: migration-based recommendations, climate-based recommendations, and conflict-based recommendations.

The output of a scoping study can vary and is meant to reflect the purpose of the study. For us, the purpose was to produce a policy framework of the most relevant recommendations based on the criteria above. This meant conducting thematic analysis around the criteria for relevance and the type and categories of recommendations, and compiling these recommendations into a framework.

3.3. Limitations

There are a number of limitations on this study, as in any piece of research. As mentioned before, this research uses a mixed methods approach with qualitative and quantitative data. While qualitative data will cover all time periods, the survey data is from a one to two month time frame alone. Survey data collected within a one to two month time frame provides a snapshot of the situation during that specific period, limiting the ability to capture how the relationship between variables may change depending on long-term trends, changes over time, and potential seasonal variations. This includes a limited ability to include fixed effects for things like time in our regression model. Secondly, the availability of information from each state is different. The DTM data, for example, is only available from Galmudug while interviewees in general were more familiar with dynamics in Hirshabelle than in Galmudug. Lastly, while the DTM data provides insights to conflict-affected areas of Somalia, data and information on Hirshabelle and Galmudug is somewhat limited given conflict dynamics. Accordingly, findings are limited to reports provided to the research team by IOM and interviews, what is available on the internet in English language, the responses of key informants who agree to an interview during the time of the study, and the responses in the survey data.

4. Empirical Analysis

4.1. Analysis of Climate-Conflict Pathways - Question #1

This section seeks to answer the first research question (and sub-questions), and sheds light on the impact of climate change on conflicts in Hirshabelle and Galmudug states along the four pathways mentioned above. By using a process tracing methodology, this analysis aims to give a deeper understanding of economic, social and political tensions and environmental dynamics. In the following we examine the various CPOs identified in the literature review in more detail and explore the (in)validity based on evidence coming from (so far) eight key informant interviews (KII) with experts on Hirshabelle and Galmudug states, as well as the findings produced by the multi-linear OLS regression models extracted from the Galmudug Household District Profiling dataset. The results of our model can be seen in table 1 below.

Table 1:

	Dependent variable:	
	conflict	injury
	(1)	(2)
Number of times forcibly displaced	0.021***	0.010
	(0.007)	(0.006)
Change in weather	-0.066**	-0.102***
	(0.032)	(0.028)
Reduced livelihoods	0.085***	0.039**
	(0.023)	(0.019)

Government approval	0.003	-0.009
	(0.008)	(0.007)
Perceptions of community discrimination	0.211***	-0.003
	(0.023)	(0.020)
Household Status	-0.104***	-0.038**
	(0.021)	(0.018)
Moving for livelihood-related reasons	0.220***	0.087***
	(0.023)	(0.020)
Female freedom of movement	-0.014	-0.061**
	(0.032)	(0.027)
Geography	-0.287***	-0.141***
	(0.031)	(0.027)
Income	0.006*	0.015***
	(0.003)	(0.003)

Constant	0.152***	0.103**
	(0.058)	(0.050)
Observations	1,560	1,560
R^2	0.257	0.070
Adjusted R^2	0.252	0.064
Residual Std. Error (df = 1549)	0.384	0.330
F Statistic (df = 10; 1549)	53.649***	11.686***
Note:	*p<0.1; **p<0.05; ***p<0.01	

4.1.1. Livelihoods

CPO 1: Climate change negatively impacts livelihoods

It is first worth mentioning that the interviews revealed a consensus that climate change has a significant impact on all communities in the Galmudug and Hirshabelle states. However, in line with the literature discussed above, the experts emphasized that communities face different vulnerabilities in relation to climate change. Specifically, they noted the distinction between displaced people and host communities, stating that IDPs are more severely affected by climate change compared to host communities. Other experts focused on pastoralist and agriculturalist communities. While some argued that agriculturalist communities have more available mitigation strategies, such as receiving remittances from abroad, others contended that pastoralists are less vulnerable to resource scarcity, particularly in terms of rainfall, as they can move to areas with freshwater and vegetation. Additionally, pastoralists have a long history of adapting to changing weather conditions, and therefore the ongoing drought is not a new phenomenon for their communities. Furthermore, geographic locations were also found to have varying levels of vulnerability. According to the KIIs, Galmudug is less vulnerable than Hirshabelle due to a higher percentage of pastoralists and the fact that Hirshabelle is at the center of counter-terrorism operations. Lastly, a crucial difference in the Somali context is the varying vulnerability of majority and minority clans.

Throughout the interviews, several significant negative impacts of climate change on livelihoods were mentioned, including:

1. Deterioration of livestock health: The health of livestock, such as cattle, is negatively affected by climate change. They are in particular sensitive to higher temperatures. If the temperature increases beyond 1.5 degrees Celsius, it becomes difficult for them to survive. This leads either to a loss of animals within the communities relying on livestock as a primary source of livelihood, such as pastoralists. Or, to a decline in livestock prices since the quality and condition of the animals deteriorate. As a result, pastoralists face increased pressure to sell their livestock immediately, which can have a negative effect on their income.

2. Loss of crops and decreased harvest ability: Climate change can result in the loss of crops, making it challenging for agricultural communities to maintain their agricultural productivity. The ability to harvest crops also decreases, possibly due to factors like changing rainfall patterns, increased diseases, or extreme weather events. These factors contribute to a decline in crop productivity, affecting the livelihoods of agricultural communities.

3. Decreased grazing lands: Climate change can impact the availability and quality of grazing lands for livestock. Factors such as reduced rainfall, desertification, or land degradation can lead to a decrease in suitable grazing areas. This poses challenges for pastoralist communities as they heavily depend on grazing lands to sustain their livestock.

4. Decreased water availability: Climate change affects water resources, leading to reduced water availability in affected regions. This negatively impacts communities reliant on water for various purposes, including drinking, livestock watering, and irrigation for crops.

In the specific case of Hirshabelle, the presence of the Hirshabelle river poses the risk of flooding. Climate change can contribute to more frequent or intense rainfall events, potentially leading to river flooding. This can result in significant damage to infrastructure, displacement of communities, loss of crops, and other negative consequences for the affected population in the region.

However, by drawing on some adaptation strategies that communities have employed to cope with the impacts of climate change, the KII have shown that reductions in livelihoods do not always lead to negative outcomes. One prominent adaptation strategy is migration. In particular, pastoralist communities have a long history of adapting through migration, which involves moving their livestock to areas with more favorable conditions such as access to water and grazing lands. Migration is considered a main mitigation measure and has been practiced for centuries by these communities, indicating that it is not a new phenomenon in response to climate change.

Throughout the interviews, it has been mentioned several times that people tend to migrate more and more to the outskirts of urban areas where they have possibilities to diversify their income. For instance, they engage in activities such as opening small businesses, work as technicians, setting up kiosks, or selling goods on the streets. These income-generating

strategies help them adapt to the changed environment and sustain their livelihoods. However, they have also mentioned the challenges that people face migrating from rural areas to urban areas including acquiring new skills to generate income, buying accommodations or paying school fees for their kids.

Another point that emerged from the interviews is the limitation of isolating the negative impact of climate change on livelihoods. It has often been argued that the negative impact on livelihoods caused by conflict, particularly the presence of armed groups like AS, outweighs the impact of climate change alone. Armed conflict disrupts communities, compromises security, hampers economic activities, and further exacerbates the challenges faced by vulnerable populations. This perspective highlights the complex interaction between climate change and other socio-political factors that can influence livelihood outcomes.

In sum, we can **mostly validate** the CPO. The KIIs gave strong evidence that climate change can have negative impacts on livelihoods, while there are great differences depending on the geography, clan power, and availability of adaptation strategies among different populations. However, the interviews also indicated that it is difficult to isolate the negative impacts of climate change on livelihoods, given the conflict dynamics that influence the relationship, meaning we cannot accept that climate change is a sufficient explanation for reduction in livelihoods in either state.

CPO2: Reduced livelihoods results in increased support for armed groups

It is first worth noting that armed groups under this CPO include not only AS and other insurgent groups, but also clan militias and the Somali Armed Forces (SAF). This is an important distinction as some experts argue that individuals who have reached the end of their tether, enduring exploitation by AS, may feel compelled to fight back and join clan militias. It has been argued by some experts during the KIIs that these individuals, who can no longer rely on their agro-pastoral livelihoods due to exploitation and high taxes despite challenges due to drought, might see joining armed groups as a means of resisting their oppressors.

However, most of the KIIs contended that people are selling their livestock, gold, or any other resources to support the upcoming second phase of operations against AS rather than joining armed groups themselves. While in the initial phase, communities were joining the operations and taking up arms, in support of the next phase they are selling more and more of their resources to contribute to the operations. This suggests that the motivation behind aiding armed forces fighting against AS is not directly linked to reduced livelihoods.

In the existing literature, it is argued that some people may join clan militias or AS due to the need for a new source of income. However, there is no evidence resulting from the KII to suggest that financial incentives are being provided to encourage individuals to join the clan militias. Again, it is rather the contrary since they are selling their assets to aid the armed forces. Therefore, it is implied that the decision to join is not primarily driven by economic incentives.

In short, the findings of our interviews **somewhat invalidate** the argument that reduced livelihood or economic motivations are the main drivers behind joining armed groups.

CPO3: Reduced livelihoods increases inter and intra-community conflict

We hypothesized that in order for there to be some validity to this assumption the following hypothesis must be true: *If a respondent reports their household having reduced livelihoods, then these households will be more likely to report conflict or injury than households who do not report reduced livelihoods.* Utilizing our multi-linear OLS model, in Table 1 we found that reduction in livelihoods is a statistically significant variable in both models. To be precise, those reporting to have reduced livelihoods, as measured by reports of owning less animals compared to five years ago, are 8.50% more likely to report household engagement in conflict and disputes in the past year, and 3.90% more likely to report a member of the household had been injured or killed due to violence or conflict in the past year. This confirms that there is some statistically significant, positive relationship between these variables that warrants further investigation and validation, although it does not confirm the hypothesis is correct.

Further exploration of the micro-mechanisms show that reduction in livelihoods is only a statistically significant variable in combination with another variable, notably moving for livelihood-related reasons, perceptions of community discrimination, and income. This indicates that while there is some relationship between reduced livelihoods and conflict, it is likely indirect and better explained under other pathways such as migration and elite exploitation. This tracks with the literature from ***CPO5: Changing mobility patterns result in increased intra- and inter-group conflict.*** In Hirshabelle for example, conflicts between agricultural and pastoralist communities often arise when pastoral communities, faced with drought, migrate from dry areas to river areas and allow their herds to graze on existing farms. Agricultural communities may also migrate, particularly after flooding. However, these mechanisms are captured under the migration pathway (see CPO5).

The mechanisms indicated in the literature for this CPO were livestock raiding or the stealing of other assets to supplement lost household income. Some experts, especially those working on the ground, noted that some individuals resort to stealing animals when they have lost their own cattle due to drought or flooding. However, it was mainly noted as a factor driving small scale conflicts. When mentioned, the concern with such incidents was that when there is already existing conflict between clans, a seemingly “simple” act of theft can reactivate long-standing conflicts that have persisted for decades. Furthermore, experts highlighted during the KIIs that even in situations where conflicts may emerge due to reduced livelihoods and resource scarcity, collaboration becomes crucial at a certain point. Examples were given where clans reached agreements to share and utilize specific water points within the area. Such agreements have been successful in resolving historical conflicts between clans, demonstrating the potential for collaboration and dispute resolution in challenging circumstances.

Based on the quantitative evidence above, this CPO is **somewhat validated.** The model and the interviews both indicate there is some validity to this causal process observation. However, both also indicate that reduction in livelihoods may influence conflict dynamics in conjunction with mechanisms under other pathways - such as migration or elite exploitation. The evidence from the regression in particular indicates that the relationship between livelihoods and conflict may be more expansively explained under other causal mechanisms such as ***CPO5: Changing mobility patterns result in increased intra- and inter-clan conflict.***

4.1.2. Migration

CPO4: Resource scarcity changes mobility patterns, especially for pastoral communities.

According to the arguments of the interviewees supporting CPO 4, climate change significantly affects the movement of people, especially pastoral communities. The impacts of stronger rain or drought, as well as the availability or scarcity of resources such as pasture, grazing land, and water, play a crucial role in determining the mobility patterns of these communities. In response to climate-related changes, pastoralists (but also agricultural communities) may be compelled to seek resources elsewhere, leading to increased movement.

The KIIs and the DTM data showed that urban areas often become a destination for pastoralists, who may settle definitively in the outskirts of cities such as Dhuusamareeb, Cadaado, and Cabudwaaq in Galmudug. This shift is motivated by improved access to services within urban centers, including water, markets, and veterinary services for their vulnerable livestock. Settling in urban peripheries provides a more secure way of life compared to the uncertainties associated with constantly moving in search of resources. According to the DTM data in the year 2022, climate-related displacement accounted for a significant portion (71%) of all new displacements.

Some experts highlighted, on the contrary, that the relationship between climate change and mobility patterns is not direct or linear. It is acknowledged that people are displaced or move due to multiple factors, with some identifying armed conflict as the primary and most significant trigger. Displacement often occurs as a result of the presence of armed groups, and climate-related factors may simply contribute to the final decision to move.

The KIIs revealed further that the protection of major clans also plays a significant role in regard to mobility decisions. It was highlighted that living in rural areas without the protection of major clans can be difficult and risky. To ensure their safety and survival, members of minority clans may be compelled to move to urban areas where they can access livelihood opportunities.

While arguments in favor of this causal process emphasize the influence of climate-related factors and the movement of people to urban areas in search of better resources and security, the interviews also highlight the multifaceted nature of displacement, with armed conflict being a primary driver. The protection of major clans is also identified as a key aspect influencing mobility decisions. Overall, the relationship between climate change and mobility patterns is complex and interconnected with various social, economic, and security factors, and therefore we can say this pathway is **somewhat validated** if this complexity is accepted.

CPO 5: Changing mobility patterns result in increased intra- and inter-clan conflict.

Within this CPO, we hypothesized that moving for livelihood-related reasons has a positive relationship with household reports of engaging in disputes or conflict in the past year and reports of a household member being injured or killed in the past year. This is a critical hoop test for this CPO. In our model, moving for livelihood related reasons was one of the most significant and impactful variables across all tests.

Specifically, in table 1 we can see that those who report a household member moving for livelihood related reasons are 22.00% to report that the household engaged in disputes or conflict in the past year and 8.70% more likely to report a member of the household had been injured or killed due to violence or conflict in the past year. Additionally, the analysis reveals that moving for livelihoods-related reasons, such as pastoral migration or moving for job opportunities, is a variable which increases the significance and impacts of other variables. As identified above, reduction in livelihoods is only significant in conjunction with moving for livelihood-related reasons, indicating that losing animals only leads to conflict when associated with migration. All in all, there is significant statistical evidence to suggest a positive relationship between movement - at least for livelihood related purposes including pastoral nomadic reasons and searching for economic opportunity in urban areas - and conflict, thus confirming this test passes the statistical "hoop."

Similar to the other sections, it is critical not to take this "hoop" test as full confirmation of the validity of the CPO. Rather, we will now explore the mechanisms of this CPO with the qualitative findings of the interviews. CPO 5 highlights that changing mobility patterns result in increased inter-clan conflict. This can be further understood through two specific mechanisms: CPO 5.1, which states that an increase or change in mobility leads to resource competition, changes in power dynamics, or clan composition, and CPO 5.2, which explains that these changes then escalate into intra- or inter-clan conflicts.

The interviews did provide evidence in support of these causal processes. Some experts indicated that during droughts clans rush into areas with access to vital resources such as water and grazing land, which can trigger conflicts as different clans compete for limited resources. Every time there is movement across territories there is a chance of conflict due to power dynamics between clans and/or subclans. Experts also highlighted during the interviews that tensions may arise when people move into urban areas where the host community perceive them negatively due to eventual overpopulation and already scarce resources. The settlement of pastoralists in the outskirts of urban areas puts pressure on existing services and increases the likelihood of violent events. Competition over resources, including basic services and land ownership, can arise between displaced and host communities, particularly when settlements are established in environmentally unsustainable areas.

However, scarce resources and overpopulation do not matter if the displaced community is from the same clan. This shows that the negative perception might also be associated with a fear that the incoming community could alter the clan composition and thus shift potentially the power dynamics that were previously present. The absence of clear land demarcation and defined ownership further compounds the issue, as conflicts emerge due to the dynamics between clans and subclans when crossing territories.

These mechanisms have been described in both states but are particularly noted to occur in Galmudug in the outskirt of the cities Dhusamareb, Cadaado, and Cabudwaaq and in Hirshabelle in the areas of Mataban, Beledweyne, and Jowhar.

In the backdrop of this CPO, interviewees highlighted potential mitigating factors and dispute resolution mechanisms. Agreements between conflicting clans demonstrate the potential for resolution through dialogue and negotiation, which demonstrates that even if migration does

lead to dispute there are mechanisms which could reduce the likelihood of this escalating into violence. Some clans have established agreements with others, employing strategies such as sending women and children to access lands first as they are less likely to engage in armed conflicts. Interclan adaptation through intermarriage, strict local laws, and relocation to areas with existing linkages are also mentioned as measures to reduce conflicts.

Dispute resolution mechanisms, including traditional approaches facilitated by elders, such as *xeer* bring elders together to discuss and reach an agreement. In Galmudug, mediation processes such as the Galckaayo process offer opportunities to address intra- and inter-clan conflicts. Another example has been mentioned of the Mataban district in Hirshabelle, where neighboring communities attempt to reach out to each other through community elders, utilizing hybrid reconciliation mechanisms that combine traditional and religious approaches, referencing lessons from Islam.

Additionally, when people move to urban areas, they often establish relationships with the host community, creating a less hostile environment compared to rural areas. While issues related to land may still arise, competition over grazing land and water points decreases, especially as many individuals sell their livestock before migrating to urban areas.

According to the interviews as well as the quantitative analysis the relationship between changing mobility patterns and increased intra/inter-clan conflict in Hirshabelle and Galmudug states seems to be **mostly validated**. However, the interviews have revealed the existence of strategies and mechanisms aimed at mitigating tensions, resolving disputes, and promoting peaceful coexistence among moving clans. It is crucial to highlight these often overlooked strategies in the literature. The interviews clearly indicate that conflicts among moving clans typically arise due to the absence of effective conflict resolution mechanisms or clearly defined land boundaries. However, implementing the aforementioned strategies can help mitigate the potential impact of this CPO.

CPO6: IDP camps are hot spots for recruitment to armed groups

In general, we did not receive detailed information on this CPO. However, experts tended to reveal that IDP camps may not be hot spots for recruitment.

First, many displaced individuals seek refuge with their extended families or within their own clans. This creates a support network where communities host each other, offering mutual assistance and solidarity. The existence of such community support networks can act as a significant adaptation strategy, fostering resilience and reducing the likelihood of individuals being recruited into armed groups.

Secondly, displaced communities living in these camps have the potential to generate income. They can seek employment opportunities in urban areas among the host community while residing in the IDP camps, benefiting from lower housing costs. This income generation allows them to sustain themselves without resorting to joining armed groups for financial support.

Therefore, we can say the evidence around this CPO **somewhat invalidates** the idea that IDP camps are hot spots for recruitment. However, much more evidence is needed to make any definitive conclusions.

4.1.3. Armed Groups

CPO7: Climate change increases grievances against the government at district, state, and/or national levels

Largely, KIIs contradicted CPO7 as the literature has traditionally presented it. While the support for AS is decreasing significantly, the support for the operations of government at district, state and federal level against AS is overall increasing.

The interviews showed that during drought periods, IDPs approach security forces, including both clan militias and government forces, to request assistance with water and security. In contested areas where AS has been present, the security forces play a significant role in maintaining law and order, ensuring the security of IDPs, and intervening to stop conflicts between neighboring communities. Their presence and actions demonstrate a commitment to maintaining stability and addressing the needs of the affected population, which may reduce grievances against the government.

Moreover, the Federal Government of Somalia (FGS) has enjoyed significant support from the public, both within states and among diaspora communities who have provided financial support for government operations. The FGS currently has huge political capital in Hirshabelle and Galmudug, which likely enabled momentum and success in their operations against AS. In support of this, there have been instances of local communities mobilizing their own defense forces to combat AS. The fact that communities are actively engaged in efforts to counter AS suggests a level of cooperation and support for security operations, which may contribute to a more positive perception of the government's efforts. At the Hirshabelle state level for example, the recently discharged governor of Hiraan had been actively involved in operations and had gained political leverage and support for his visible role in addressing security issues.

It is crucial to acknowledge that the interviews have indeed revealed a connection between the growing grievances, declining support for armed groups like AS, and increasing support for operations led by the Somali National Army. However, climate change might be one of the contributing factors. It is thus important to understand that these shifts in support are not solely driven by environmental concerns. Various sociopolitical issues also play a significant role in shaping the dynamics observed. However, given the evidence, this CPO is **mostly invalidated** in the context of Hirshabelle and Galmudug.

CPO8: Grievances vs the "state"/"the government" increases support for armed groups

If grievances against the state drive support against armed conflict, we would generally expect there to be a negative relationship between support or positive views of the government and conflict and violence. Within our OLS regression model, however, there is no statistically significant relationship between government approval and household level reports of conflict. While this isn't enough to fully eliminate this hypothesis it does suggest that perhaps support for government and/or grievances against government are not the most significant factors driving rates of conflict, contrary to many pieces of popular literature which rely on theory of government grievances. Further determination about the validity of this pathway requires exploring qualitative evidence.

Community perceptions and experiences of AS brutality and exploitation, such as taxation during drought periods, have led to rising mobilization against the armed group. As a result, support for AS has decreased, while support for clan militias has increased. Communities have chosen to sell or provide their resources to support clan militias in their fight against AS. Furthermore, the federal government has gained significant support from communities for its operations and its collaboration with for example with the local militia *Ma'Wisley* (the wearers of "*ma'awis*", the sarong worn by Somali farmers). This is indicating not a general decrease in support for armed groups (since local militias are supported), but gives evidence for a clear increase in support for government-backed initiatives.

Contrary to this, some experts highlighted that minority clans in Somalia, who lack social networks and access to the same services as majority clans, are more vulnerable to the effects of climate change. This vulnerability and marginalization create a fertile ground for recruitment by armed groups such as AS. The link between minority clans and AS recruitment is attributed to the sense of grievance resulting from their disadvantaged position within the state system. The local conflicts stemming from inequality and marginalization contribute to the recruitment of minority clans, sustaining AS's presence in Somalia.

Interviews have shown that the context of armed actors in Hirshabelle and Galmudug states in Somalia is complex given the presence of several different groups who are also interlinked with operations of the state or adopt governmental structures. Hence, validating or invalidating this CPO is not straightforward, as it is not as simple as confirming public support for against the government or for or against AS. Nonetheless, this CPO is **somewhat invalidated** in the case of increasing support for non-government-aligned actors like AS. Instead, it is worth noting that our evidence indicates that grievances are instead increasing against non-state aligned groups like al-Shabaab and subsequently increasing support for government-aligned armed groups such as clan militias or the SAF.

CPO9: Armed groups change tactics and operations based on climatic changes to geography and resources

Throughout the interviews it has been noted that AS has adapted its tactics and operations in response to climatic changes. Firstly, they have adapted their measures to reduce environmental degradation. They implemented environmental-friendly measures such as banning charcoal and tree cutting, as well as plastic bags, and have engaged in environmental restoration efforts. This adaptation suggests that armed groups are aware of the impact of climate change and are utilizing it as part of their strategies.

On the other hand, AS has used community climate change vulnerabilities to exact revenge on communities that have actively opposed them. They have targeted areas affected by drought with limited water availability, utilizing tactics such as burying or poisoning wells and imposing additional taxes on livestock. Interviews indicate this is happening in both states. Specifically, experts mentioned this occurring in Cadaado in Galmudug, where AS destroyed and later poisoned a water well, as well as in Mataban in Hirshabelle, where AS started to bury wells and disabled communication lines. They especially target the *Hawadle* clan, which is known for its support and mobilization against AS.

While some experts highlighted a clear linkage between armed group operations and climate change, others argued that AS is primarily driven by their ideology and political motivations rather than being directly influenced by climate change-related factors.

Accordingly, this CPO is only **somewhat validated** because, although interviews give evidence that armed groups are incorporating climate-related considerations into their strategies and targeting vulnerable areas, there are also voices that contend that armed groups' activities are primarily motivated by ideology and international factors rather than direct climate change-related factors. Accordingly, if climate change is being used in tactical considerations, it may not be in a fully intentional or conscious way.

4.1.4. Elite Exploitation

CPO 10: Climate change increases political competition and intensifies marginalization.

CPO 10 highlights the impact of climate change on political competition and the exacerbation of marginalization. In the face of climate change, there are situations where the government concentrates and reallocates resources to particular clans in specific regions. However, this allocation process can result in grievances among other clans and communities who perceive themselves as marginalized or excluded from accessing those resources.

The consequences of this resource concentration and reallocation can be significant. It creates a sense of disparity and inequity among different clans and communities, as they observe certain groups receiving preferential treatment while they struggle to secure their fair share. The perception of being marginalized or excluded from resource allocation processes can deepen existing tensions and foster social divisions, which are discussed in CPO12 below. Furthermore, this unequal distribution of resources can amplify existing power dynamics within society. Clans or groups that gain access to concentrated resources may strengthen their political influence and consolidate their positions of power. This intensifies the competition for resources and political control, leading to increased political rivalries and potential conflicts.

Based on the interviews and evidence described above, this CPO is **mostly validated.**

CPO 11: Low-intensity conflicts can be manipulated and politicized by elites and escalate into broader conflicts (COP 11)

CPO 11 sheds light on the manipulation and politicization of low-intensity conflicts by elites, which can escalate into broader and more severe conflicts. Primarily occurring in rural areas, these conflicts often revolve around land disputes, some of which are influenced by climate change. However, the consequences of these disputes extend beyond rural regions and spill over into urban centers like Jowhar. They become intertwined with broader political disagreements centered around power dynamics and the sharing of resources.

At the heart of these conflicts lie power distribution and governance structures, particularly at the state level. The migration of people from rural to urban areas further complicates the situation. As people move, it alters the composition of clans and creates tensions between host communities and those who have been displaced. This demographic shift has a direct impact on power sharing and governance structures, leading to disputes and challenges in maintaining stability.

During interviews, it was noted that Somalia has experienced high levels of water privatization due to the absence of a functioning state. The privatization of water sources and the exploitation of drought conditions by private landowners contribute to increased prices and conflicts over access to water resources. This dynamic allows elites to exploit their control over private water resources, aggravating existing conflicts and vulnerabilities, particularly within minority clan dynamics. The lack of a state-society relationship further complicates the issue, as there is no effective mechanism for addressing water privatization and managing water resources. Taking steps to address water privatization and establish a government role in water management could potentially reduce the risks of conflicts and enhance the state-society relationship.

These factors highlight the intricate interplay between climate change, access to resources, power dynamics, and governance structures. The combination of these factors can create a volatile environment that leads to conflicts and poses challenges to maintaining stability. Addressing these issues necessitates attention to effective water management practices, equitable distribution of power, and the establishment of inclusive governance mechanisms that take into account the diverse needs and perspectives of different communities and clans.

Based on the evidence above, this CPO is **mostly validated.**

CPO12: Marginalization produced by political competition increases the risk of conflict.

As political competition and elite exploitation persists, it can increase societal divisions and feelings of marginalization and exclusion. Recognizing this, we utilized our regression model to explore how perceptions of community discrimination link to conflict and injury. In table 1 we can see those reporting perceptions of community discrimination are 21.11% more likely to report conflict. This variable, along with moving for livelihood-related reasons, is one of the most significant variables in the entire model, indicating that sentiments of community discrimination have a significant relationship with reports of engaging in conflict or disputes. Through qualitative data we can better understand the mechanisms of these disputes.

The interviews highlighted the emergence of unresolved power allocation issues and significant grievances related to resource distribution among clans. Experts have described this situation as a clear and undeniable pathway to conflict. Addressing climate issues alone is deemed impossible without simultaneously tackling existing power dynamics, clan marginalization, and broader political challenges.

Furthermore, there is a lack of a comprehensive framework for sharing resources, leading to the exacerbation of grievances at the clan level. Dominance by a single clan further intensifies discord with other clans in the region, as they perceive resources to be disproportionately and unfairly reinvested in that particular clan rather than being equitably redistributed. This reignites dormant grievances and perceptions of discrimination and is influenced by various political and socio-economic nuances. Based on this evidence, we can say that CPO12 is **mostly validated.**

4.1.5 Conclusion of Question #1

Overall, our analysis revealed a number of interesting revelations about the causal processes linking climate change to conflict. The findings of our research is summarized in table 2 below based on the color coding presented in the methodology.

Table 2

Pathway	CPO
Livelihoods	***CPO 1: Climate change negatively impacts livelihoods***
	CPO2: Reduced livelihoods results in increased support for armed groups
	CPO3: Reduced livelihoods increases inter and intra-community conflict
Migration	***CPO4: Resource scarcity changes mobility patterns, especially for pastoral communities.***
	CPO 5: Changing mobility patterns result in increased intra- and inter-clan conflict.
	CPO6: IDP camps are hot spots for recruitment to armed groups
Armed Groups	***CPO7: Climate change increases grievances against the government at district, state, and/or national levels***
	CPO8: Grievances vs the "state"/"the government" increases support for armed groups

	CPO9: Armed groups change tactics and operations based on climatic changes to geography and resources
Elite Exploitation	***CPO 10: Climate change increases political competition and intensifies marginalization.***
	CPO 11: Low-intensity conflicts can be manipulated and politicized by elites and escalate into broader conflicts (COP 11)
	CPO12: Marginalization produced by political competition increases the risk of conflict.

Based on the evidence above, we can conclude the following regarding the validity of the pathways in Hirshabelle and Galmudug:

Livelihoods: While it is acknowledged that climate change has impacted livelihoods, our research generally indicates that reduced livelihoods may have more indirect links with conflict. For example, rather than forcing someone to join an armed group, our OLS regression model indicates it is more likely that the loss of livelihoods influences conflict through factors discussed under the migration pathway. While qualitative evidence indicates that a decline in livelihoods could contribute to instances of cattle raiding, actual conflict arises when preexisting clan tensions remain unresolved. Accordingly, livelihoods must be considered as a relevant factor when taken into consideration with other elements.

Migration: There is some evidence, which must be taken with its limitations, to support that environmental changes can impact mobility patterns, which can subsequently result in resource competition, changes in clan composition, and shifts in power dynamics.The evidence does not suggest that the primary mechanism through which this occurs is by increasing IDP vulnerability to armed group recruitment. Rather, these factors can trigger conflicts both within and between clans. Disputes primarily arise when negative perceptions persist between displaced communities and host communities, often due to unresolved grievances. The absence of clear land demarcation and effective conflict resolution mechanisms further amplifies the risk of competition for limited resources. Nevertheless, it is important to highlight that the report identifies several strategies for conflict mitigation. These strategies aim to foster positive relationships between clans and include the implementation

of effective dispute-resolution mechanisms and the establishment of inter-clan agreements. By adopting such approaches, it is possible to mitigate conflicts and promote harmonious interactions among different clans.

Armed Groups: In general, our research findings challenge the validity of theories that link grievances to increased support for armed groups. For example, our model finds no statistically significant relationship between approval of the government and conflict. While support for armed groups in general is increasing this is not the case for non-state-aligned armed groups like Al-Shabab (AS), as is discussed in most literature on this topic. Rather, support for non-state actors like AS is decreasing against the backdrop of climate change while support for government-aligned groups like clan militias and the SAF is increasing. This distinction is critical for the broader community of practice to consider outside of Hirshabelle and Galmudug, rather than assuming support for armed groups always means support for non-state-aligned actors. Our research also identified some evidence suggesting that armed groups, particularly AS, adapt their tactics in response to climate change, albeit not as part of a deliberate strategy.

Elite Exploitation: In the context of Somalia, elite exploitation emerges as a significant factor in understanding the impact of climate change. The competition for resources, driven by climate change, worsens existing social divisions and exacerbates tensions among marginalized clans and communities. This, in turn, fuels political rivalries and power struggles. The evidence presented in this report indicates that climate change not only intensifies political competition and marginalization but also enables elites to manipulate conflicts for their personal gain. As a result, there is an increased risk of conflicts arising from marginalization. These findings highlight the importance of addressing elite exploitation and promoting power-sharing settlements as crucial aspects and prerequisites for effective conflict mitigation and resolution strategies.

Having analyzed and discussed the applicability of the different CPOs in the context of Galmudug and Hirshabelle, we now shift our focus to the second research question. In this section, we explore existing recommendations for relevant strategies, policies, and programs that aim to address the interconnection between climate, security, and mobility in the target regions.

4.2. Scoping Study - Question #2

The tables summarize the existing recommendations in the literature for addressing climate change, conflict, and migration in Galmudug and Hirshabelle States. A total of 294 recommendations were analyzed and divided into three main categories: the “most relevant policies (123), the “relevant” policies (129), and “not relevant” policies (42). All the policies and recommendations were carefully analyzed and only the most relevant and relevant policies were selected for the framework. The table summarizes a total of 252 recommendations divided into three categories. First, conflict mitigation with four main strategies. Second, climate change adaptation including five strategies, and third, Migration with three major strategies. While a lot exists on climate change and/or conflict, it is important to highlight that, only a few strategies were identified to address the migration considerations that come from the climate change-conflict nexus.

Recommendations come from literature that not only speak about the issues of climate change, conflict and migration in Galmudug and Hirshabelle, but also in Somalia and countries around the Horn of Africa facing similar challenges. Thus, specific work needs to be done to refine the details of the implementation of these policies in Galmudug and Hirshabelle States. However, each strategy, policy and program recommendation comes from experts in the field and have been specifically analyzed for relevance, including feasibility, in the both states. It is worth noting that these strategies require efforts from every actor in this context, including national, district and local governments, the international community, civil society, and others. It is also critical to include minority and marginalized groups in these efforts.

The following is a summary of each strategic category:

Conflict: The major strategies outlined under conflict mitigation involve reinforcing and supporting the strengthening of laws and governance structures at the national, regional and district level, the effective inclusion and participation of all groups but particularly marginalized groups in political processes, and the implementation of effective land and resource management policies.

Climate change adaptation and mitigation: The mitigation strategies to address climate change effects and ensure sustainable livelihoods of pastoral and agricultural communities as it appears in the literature include the implementation of programs to ensure food production and sustainability, implementation of development policies and land tenure arrangements that appropriately recognize the needs and interests of pastoralists as well as those of agriculturalists, and the strengthening of resource management and allocation. This can be possible with amplified dialogue to encourage environmentally sustainable actions against climate change.

Migration: To cope with challenges associated with migration, the literature suggests that support should be provided to improve land usage by displaced communities, through the identification of strategic areas for density increase and land readjustment (rezoning) as well as improvement of roads, water infrastructure, commercial functions, and sociocultural centers. In addition, a migration policy should be implemented; this requires a rethink of the borders and limitations of what is called a rural community or urban area. Then, new narratives should be fostered about borderland regions as zones of opportunity, intercultural exchanges, and regional integration.

CATEGORIES	STRATEGIES	PROGRAMS/POLICIES
Conflict Mitigation	Ensure effective inclusion and participation of all communities, including marginalized groups and reinforce the security sector	**IDPs & Host Communities:** - Support IDPs and host communities equally - Convince host governments to grant refugees greater freedoms - Include IDPs and host communities in environmentally friendly and environmental protection activities

		- Encourage dialogue and political inclusion of various groups in decision making, especially around natural resource management - Ensure inclusion of marginalized groups in dialogues using the local reintegration analysis (LORA) methodology to monitor progress of inclusion - Convince host governments to grant refugees greater freedoms - Include IDPs and host communities in environmentally friendly and environmental protection activities.
	Security sector reform	- Effectively create and establish the rule of law - Creation of district-level police station with qualified police force to punish crimes - Align national, regional and global laws on good governance, including respect for the rule of law and constitutionalism, transparency and accountability, equity and equality in the distribution of resources - Manage intra-state violence and cross-border violence – through improved community security along the porous borders; civilian disarmament; and the disbandment of illegal gangs in urban areas and ethnic militias in pastoral communities. - Improve security, including measures to: improve the capacity and training of the police and access to law; control and reduce access to small arms; and combat and prevent cattle rustling, raiding, and similar crimes. - Support for efforts to control and reduce possession, transfers and use of small arms and to prevent and combat cattle rustling and its increasing links with criminal networks.

	Regional, national and district level peacebuilding and conflict mitigation strategies	**Regional level:** - Encourage regional cooperation to address conflict - Strengthen inter-REC (regional economic community) coordination in contextual monitoring for conflict prevention - Ensure the best approach in addressing transboundary threats across borders through strategic, comprehensive and expeditious strategies and actions towards sustainable use and management of cross border resources for peaceful coexistence among communities. **National Level:** - Review core power-sharing arrangements (including presidency, state legislature, security apparatus, state capital) - Encourage peaceful dialogue via workshops and conferences - Take measures to reduce the rivalries and socio-cultural divisions between the various tribes and communities living in the area/raising awareness of each other's problems and needs, and participation in local decision making and joint projects. **District Level:** - District council formation and decentralization - Local communities and their institutions such as religion, local governance and social structures on conflict management should be strengthened. - The quality of governance based on state institutions, including rule of law, should be improved while also respecting and supporting traditional governance systems where they can contribute to problem-solving and upholding rules and agreements. - Develop a comprehensive understanding of the roles that pastoralism, horticulture, farming, ranching and wildlife conservation areas can all play in the

		development of each districts - Enhance opportunities for pastoralists to participate in district and national level policy processes through civil society groups.
	Land and resource governance strategies	**All actors:** - Recognizing needs of pastoral, agricultural and urban communities during land management policy making - Support engagement between government and water management committees - Promote conflict-sensitive water governance and raising awareness on the links between water and conflict **International community:** - Ensure that conflict issues are carefully addressed in country plans, and properly taken into account in development assistance programmes, including those relating to land and water resource management - Engage in close partnership with all sections of the local communities and with district and national authorities - Assist in controlling and reducing small arms. - Address flashpoints of the conflict to pre-empt further escalation and arrest the intractability of crises, to avert greater regional instability - Prioritize measures to tackle conflicts, and review actual policies
	Intensify efforts to address conflicts	- Ensuring that existing development assistance programmes contribute to efforts to prevent conflict, by helping to tackle underlying or 'root' causes of conflicts involving pastoralists and by contributing more directly to conflict prevention and peace-building efforts

Climate Change Adaptation	Amplify actions against climate	- Encourage climate activism to propel climate security up to the agenda of the UN Security Council - Ensure that national and regional climate adaptation and mitigation action plans consider local knowledge and resources to encourage participation and building local resilience - Implement policies, strategies, and programmes for recovery, resilience and disaster risk management - Establishing a research and development center that studies climate change patterns at the subregion and regional level, including exchanging research outcomes. - Prioritize resilience, mitigation, and 'loss and damage' in climate action through climate finance; introduction of carbon credits
	Increase food production and sustainability	- Equipping farming communities and policy-makers with the knowledge they need to improve production - Implement food security programming, including deployment of all possible resources to a sustainable agricultural sector and including it as part of the peacebuilding process - Support the development and capacity of the Ministry of Agriculture and relevant agencies at district level to govern and support pastoralists
	Ensure rights of the land users and assist them	- Stakeholders should monitor the progress of land deals, including monitoring of these deals by foreign donors and investors - Facilitate environmentally sustainable production systems for agropastoralists - Small farmers and pastoral communities should be familiarized with irrigation and

		water management systems, introducing drought- and heat-resistant crop varieties
	Encourage environmental conservation and build climate resilience	- Establish a national and independent environmental protection agency run by experts to help formulate appropriate mitigation measures against the impact of climate change. - Encourage individuals to enhance soil productivity and water conservation, improve soil quality, store rainwater for emergency use and develop more diverse agriculture for adaptation. - Invest in more innovative water resource techniques including water storage and water recycling - Prioritize climate-change adaptation and invest in data, research and infrastructure to support communities to cope with the impact of climate change.
	Strengthen resources management and allocation	- Promote the importance of good water governance as essential to achieve water security - Strengthen service delivery through water sector regulatory reforms - Improve systems for managing and allocating scarce resources, particularly access to water and grazing land, to reduce the intensity of competition for scarce resources and help to manage crises such as extended droughts - Adopt development policies and land tenure arrangements that appropriately recognise the needs and interests of pastoralists as well as those of agriculturalists, ranchers and urban communities.
Migration	Support communities who migrate	- Assist communities in the migration process - Embrace and facilitate cross-border mobility and regional integration. - Convince host governments to

		grant refugees greater freedoms - Improving land usage through the identification of strategic areas for density increase and land readjustment (rezoning) paired with the improvement of roads, water infrastructure, commercial functions, and sociocultural centers - Ensure both the host and climate-induced IDP communities benefit from any upgraded infrastructure - Support a “long-term durable solutions” approach to the reintegration of climate-induced IDP communities
	Adopt effective migration policies	- Migration and displacement concerning climate change should get proper attention at all levels - Prioritize a 'regional lens' in addressing the needs of borderland communities. - Build capacity for mixed migration policy indices that contribute to a regional data portal, and policy and institutional coherence for mixed migration. - A better demarcation and collaboration between all stakeholders should be implemented to include displacement and mobility as a structural characteristic of Somali cities. This may require a rethink of the borders and limitations of what is called a rural community or urban area.
	Foster new narratives	- Foster new narratives about borderland regions as zones of opportunity, inter-cultural exchanges and regional integration. - Embrace and facilitate cross-border mobility and regional integration. - Be 'borderland sensitive' by acknowledging borderlands as unique socio-economic and geographic entities

This framework is descriptive in nature, laying out the existing strategies, policies and programs which academics and policymakers believe could be relevant to climate-migration-conflict challenges. However, based on the findings for Q1 and a thematic analysis of the above policy framework, we can state the following pieces of analysis by category:

Conflict mitigation:

- Under Q1, our major findings indicate that elite exploitation is a particularly influential pathway from which climate change impacts can drive conflict. In Hirshabelle and Galmudug, the competition between elites is occurring against a backdrop of a national and subnational conflict mitigation process. Recognizing this, some interviewees indicated that the most critical aspect to solving conflict driven by climate change was in fact addressing national level issues of reconciliation. Within the scoping study, these strategies were similarly emphasized by policy and academic institutions as critical. In this way, the recommendations regarding reconciliation processes should be prioritized by the actors working on these issues in Hirshabelle and Galmudug.

- In Q1 we uncovered that sentiments of community discrimination have a significant relationship with conflict. However, while the policies in the scoping study did make recommendations around inclusion of marginalized groups, these policies encounter two significant gaps: first, they emphasize IDP-host community dynamics as the primary area where exclusion may occur. While this may occur to some extent in Hirshabelle and Galmudug, sentiments of exclusion and marginalization are more likely to occur along clan lines. Second, there was a lack of strategic-level recommendations on how to address discrimination and exclusion. Policymakers and academics should brainstorm on how to solve this strategic gap.

Climate change mitigation and adaptation:

- The strategies from the scoping study emphasize resource management and environmental stewardship. Within our research, these issues are of obvious importance - as recognized under CPO1, resource management is critical to address issues from reduced grazing land and water resources. However, our research also identified that a major obstacle to this management is the lack of established district-level governance systems, which could implement frameworks and agreements about resource management. In this way, establishing effective, decentralized governance processes and conflict mitigation can and should be considered primary climate change adaptation and mitigation strategies

- In our research, environmental degradation is significantly linked with migration. However, the policies around climate change adaptation largely rely on assumptions of working in rural territories and maintaining a status quo. Some interviewees in Q1 indicate that a reenvisioning of the future may be necessary in Hirshabelle and Galmudug - specifically, whether transhumance is a sustainable long term strategy and how these states will likely become increasingly urbanized. With the trend of increasing urbanization in particular, there is a need to proactively develop and implement climate change adaptation and mitigation strategies with effective urban planning and infrastructure development in mind.

Migration:

- Despite migration playing a significant role in the conflict-climate nexus in Hirshabelle and Galmudug, our scoping study identified the least amount of strategies, policies and programs under this category. This is in a way understandable: the full impacts of anthropogenic climate change have yet to be seen, and while there are some things we can predict, there are a large number of “known unknowns” and “unknown unknowns” which make strategizing and planning for the impacts of climate change-influenced migration difficult. Therefore, approaches should be piloted and tested for their efficacy in addressing issues stemming from climate-influenced migration.

- In line with the above analysis, it is also critical to develop evidence-driven strategies for climate-driven migration. One of the most critical recommendations that may be missing is the development of a multi-stakeholder evidence base for these strategies - identifying not only what research exists but also what approaches have been piloted and how these approaches worked. In this way, new strategies can be developed and a better understanding of the challenges of climate change-influenced migration can be built.

5. Conclusion

The Applied Research Project "Scarcity, Mobility, and Conflict in Somalia: Climate Change and the Future of Transhumance in Galmudug and Hirshabelle States" focused on the effects of short- and long-term environmental changes and their impacts on the root causes and dynamics of violent conflict: (a) livelihoods; (b) migration and mobility; (c) armed group tactics; and (d) elite exploitation.

First, we outlined a review of existing literature that revealed notable shortcomings in the understanding of the climate-security nexus. Previous research often focused on broad country-level analyses, neglecting the complexities of conflict escalation, duration, and diffusion. Additionally, the impacts of climate change were often assumed to be equal across all segments of society, disregarding the disparate effects on different social groups and livelihood activities. Furthermore, studies on the climate-security nexus in East Africa frequently overlooked the specific context of Somalia, failing to explore subnational conflicts and the significant climate change exposure faced by the country to bridge these gaps, this research project focused on the states of Hirshabelle and Galmudug in Somalia, utilizing a mixed methods approach. Through remote within-case studies, the research aimed to validate or challenge the climate-conflict pathways identified in the literature and propose effective policies to enhance resilience to climate change and conflict in these regions.

The qualitative and quantitative findings derived from key informant interviews, data and content analysis shed light on the diverse vulnerabilities experienced by varying communities in Galmudug and Hirshabelle due to climate change and the variety of strategies, policies and programs that can be used to face these challenges.

From our first question, there are several key findings that are important to highlight:

- While climate change negatively impacts livelihoods, the research recognizes migration as a crucial adaptive strategy and perhaps one of the most influential pathways linking climate change to conflict. This is especially important for pastoralist communities seeking favorable conditions and income-generating opportunities in urban areas.

- The changing mobility patterns resulting from environmental changes often lead to resource competition, changes in clan composition and power dynamics, thereby triggering intra- and inter-clan conflicts. Disputes arise when negative perceptions exist between displaced and host communities mainly because of pre-existing tensions and unaddressed grievances. Lack of land demarcation and conflict resolution mechanisms increases the risk of competing for limited resources.

- Conflict mitigation is possible through several strategies identified in the report that foster positive relationships between clans, including effective dispute resolution mechanisms, inter-clan agreements.

- Armed groups, such as AS, display adaptability by employing tactics that exploited climate vulnerabilities, including the destruction of water wells in drought-affected areas.

- Climate change-induced resource competition exacerbates social divisions, deepening existing tensions and fueling political rivalries among marginalized clans and communities.

- There is a strong relationship between community discrimination, the need for migration to sustain livelihoods, and reports of conflict. These findings indicate that different social groups experience conflict in distinct ways, underscoring the role of inequality as a significant driver of conflicts.

The scoping study conducted as part of this project highlighted several strategies that are needed to address these challenges. However, the scoping study also identified significant gaps in recommendations that academics, policymakers and practitioners should consider filling with evidence-based approaches:

1. The development of effective strategies, policies and programs on how to address community discrimination and effectively make all parties feel included in economic, political and social opportunities. These strategies, policies and programs must not only focus on IDP-host community dynamics, but addressing experiences of exclusion across broader clan dynamics.

2. The development of effective climate change adaptation and mitigation policies in recognition of increasing urbanization

3. The creation of a multi-stakeholder group to share evidence and pilot approaches to address climate-influenced migration - recognizing migration as a mitigation strategy for vulnerable communities and working, as identified in the gap above, to develop effective strategies and policies to address these changes.

All of our research findings underscore a major point: climate change vulnerability is not solely driven by climate change itself. Rather, the impacts of climate change are also shaped by broader societal influences - from a society's dominant economic activity to the functionality of the governance systems that are required to mitigate natural disasters. While Somalia is currently experiencing a severe drought, its vulnerability to the adverse impacts of climate change - in our case conflict - is shaped by ongoing conflicts and limited government capacity. In this way, it is important to emphasize that addressing the impacts of climate change requires addressing societal and institutional factors including conflict and social inequality.

Furthermore, it is important to acknowledge that when confronted with a state lacking the capacity to adapt to climate change, a number of mitigation measures and strategies can be implemented. Somalia's pastoral and agricultural communities have coped with failed rains and scorching sun for generations, developing essential adaptive strategies to address these challenges. Thus, it is important to not fall into the trap of assuming that conflict is the sole adaptive strategy that communities impacted by climate change have at their disposal. These communities possess well-established and tested dispute resolution mechanisms, as well as a key adaptive strategy at their disposal: migration. It is paramount to therefore not assume that migration is a negative impact of climate change that will increase conflict: Instead, migration is an adaptive strategy that will continue to play a role in communities across Hirshabelle and Galmudug and which must be accounted for in strategic planning and policymaking.

This research project represents a significant contribution to both the understanding of climate-conflict-migration issues in Hirshabelle and Galmudug and the broader field of climate security. By addressing the gaps in existing literature and providing comprehensive insights, this study advances the knowledge base on the climate-conflict nexus. These findings underscore the importance of addressing institutional and societal challenges in order to mitigate the impacts of climate change, and the criticality of accepting and leveraging existing adaptive strategies where possible. By doing so, stakeholders across Hirshabelle and Galmudug can hope to sustainably address the multi-faceted challenges linking climate change to conflict.

Annex A: Quantitative Analysis

1. Introduction

As outlined in the methodology section, the analysis in this annex is based on a survey of 1560 individuals across Galmudug state conducted by IOM/Somalia in the Spring of 2023.This annex breaks down the details of the OLS multi-linear probability model conducted with these results, but the results are subsequently incorporated into section 4.1 to inform process tracing. Further details on the methodology can be found in the main body of this report.

2. Data

Ultimately, based on data availability, we ran two models with the same independent variables and distinct dependent variables. This is because the dependent variables measure distinct but critical variables: *conflict* measures reports of household involvement in conflict and disputes over the past year while *injury* measures if anyone in the household has been injured or killed in the past year due to conflict or violence.

Our models based on the Galmudug District Profiling assessment are:

Model 1:

$$\widehat{conflict} = \beta 0 + change\ in\ weather + reduced\ livelihoods + government\ approval + perceptions\ of\ community\ discrimination + household\ status + moving\ for\ livelihood - related\ reasons + female\ freedom\ of\ movement + number\ of\ times\ forcibly\ displaced + geography + income + u$$

Model 2:

$$\widehat{injury} = \beta 0 + change\ in\ weather + reduced\ livelihoods + government\ approval + perceptions\ of\ community\ discrimination + household\ status + moving\ for\ livelihood - related\ reasons + female\ freedom\ of\ movement + number\ of\ times\ forcibly\ displaced + geography + income + u$$

In this, $\beta 0$ represents the intercept term of the model and u is an error term.

The dependent and independent variables are coded as follows:

Label in Model	Type	Code**	Description	Coding
Conflict	Dependent Variable 1	conflict^	Reports whether or not a household has been involved in any conflict or disputes related to animals, property or anything else in	Dummy variable: 1 if conflict or dispute reported, 0 if not.

			the past year.	
Injury	Dependent Variable 2	injury^	Reports whether anyone in the household has been injured or killed due to violence or conflict in the past year.	Dummy variable: 1 if injury or death reported, 0 if not.
Change in weather	Independent variable 1	change_weather	Reports whether or not the respondent has noticed changes in the weather patterns in the past 10 years.	Dummy variable: 0 if they did not report seeing climatic change, 1 if they did
Reduction in livelihoods	Independent variable 2	lessanimals	Reports if the household has the same quantity of animals compared to five years ago.	Dummy variable: coded as 1 if the household reported “less” or “a lot less” and as 0 if they did not.
Government approval	Independent variable #3	gov_respond	Ranks how the respondent feels the district government responds to the needs of the community, from “very low” to “very high.”	Categorical: 1 = very low 2 = low 3 = Medium 4 = high 5 = very high
Perceptions of community discrimination	Independent Variable #4	comm_discrimination	Reports whether the respondent or a member of the respondent’s household has faced exclusion or discrimination in the community.	Dummy variable: 1 if discrimination reported, 0 if it was not
Household status	Independent Variable #5	status_hh	Reports whether respondent’s household is permanent	Dummy variable: 0 if they are not not permanent resident or host community, 1 if

			resident, IDP, nomadic, host community, returnee or other.	they are
Moving for livelihood-related reasons	Independent Variable #6	move	Reports whether or not a household member has moved to different locations to generate income.	Dummy variable: 1 if move reported,, 0 if did not report move
Female freedom of movement	Independent Variable #7	femalefree	Reports whether female members of the household can move freely and without fear.	Dummy variable: 1 if they said “no never” to women moving freely, 0 if they said anything else
Number of times forcibly displaced	Independent Variable #9	forc_dis_times	Reports number of times a household has been displaced due to violence or conflict.	Continuous variable, not re-coded from original results
Income	Independent Variable #9	sqrtamount_income	Reported income generated by household in the past 30 days.	Continuous variable, not re-coded from original results but re-coded as a square root to produce a more normal distribution.
Geography	Independent Variable #10	district	Recorded which of the five districts the survey occurred in - Cadaado, Cabudwaaq, Gaalkacyo, Dhuusamarreb, or Hobyo.	Dummy variable 0 if not Cadaddo, 1 if Cadaado.

*For this variable it is important to acknowledge that 517/1560 responses are NAs. Therefore results with this variable could include a bias, as NAs make up 33% of responses.
** In this section we will use the labels for variables indicated as “code” to describe results.

3. Hypotheses

As outlined in the sections above, to answer our first research question we are testing a series of causal process observations (CPOs). This model allows us to run “hoop” tests to see if baseline assumptions about the models have some level of statistical significance. While not each CPO identified above can be tested with our models, but there are four in particular for which we can attempt to explore the baseline validity of the assumption based on the survey data. As discussed in limitations, none of these tests will reveal a full causal relationship but rather will inform the validation or invalidation of the CPOs in conjunction with qualitative data.

Livelihoods

CPO3: Reduced livelihoods increases inter and intra-community conflict

One key assumption we will test with our models is that reductions in livelihoods increase inter and intra-community conflict. While we will use qualitative information and desk research to further analyze the mechanisms, our model will allow us to explore how reductions in livelihoods influence reports of conflict and disputes as well as reports of injury or death. As Galmudug is a state whose major economic activities center on livestock, we will focus on validating the significance of the *lessanimals* variable as we explore this pathway.

Within the first model, and based on the theory in the literature review, we would expect reports of having less animals than five years ago to increase the likelihood of reporting disputes or conflict due to any number of reasons such as livestock raiding, increased migration into new territories to feed livestock impacted by droughts,, and others. The assumption is that these movements may subsequently increase violence between groups. Another assumption is that lost livelihoods increases the need to use maladaptive coping strategies, such as livestock raiding. Given these assumptions, we would anticipate that *lessanimals* and *conflict* as well as *lessanimals* and *injury* should have a positive relationship. This would be the first step in validating this theory, and failing to do so would provide some level of evidence against this assumed relationship.

Our hypothesis for CPO3 can thus be understood as the following:

- Model 1:
    - H0: lessanimals = 0
    - H1: lessanimals > 0

- Model 2:
    - H0: lessanimals = 0
    - H1: lessanimals > 0

Mobility

CPO5: Changing mobility patterns result in increased inter-clan conflict

Within this CPO, the assumption is that changing mobility patterns can increase inter-group or inter-clan conflict in a number of mechanisms. First, through increasing interaction between

pastoral groups competing over the same grazing land. Second, through competition in urban areas with internally displaced persons competing with host communities through resources. From the survey, the variable *move* best captures this, which reports whether a member of the household has had to move to generate income. While this captures movement for pastoral relocation, urbanization and other economic reasons, in general it captures any movement for economic reasons. We anticipate, based on the theories, that this variable is positively related to the *injury* and *conflict* variables.

Our hypothesis for this CPO is thus:

- Model 1:
    - H0: move = 0
    - H1: move > 0
- Model 2:
    - H0: move = 0
    - H1: move > 0

Armed Groups:

CPO8: Grievances vs the "state"/"the government" increases support for armed groups

In the literature, some theorizations propose that climate change further increases citizen grievances against the government, potentially by exposing gaps in service delivery that exacerbate existing tensions. Theoretically, these grievances may then make civilians more likely to support armed groups or otherwise engage in anti-government violence.

In our dataset, there is a data point which captures general approval of district government response. While there isn't a datapoint that we can use which would directly capture support for armed groups, as variables from the survey such as the variable which asks if the presence of armed groups increases perceptions of community safety has a significant number of NA responses. However, based on the literature above, if there is some form of linkage between grievances against the government and engagement in conflict or other support for armed groups we could generally expect a positive relationship between *gov_respond* and *conflict.* Passing this test would provide some level of validation of this relationship, and while failing to pass this test may not provide definitive evidence against this process it would weaken the argument to an extent. Thus, we have formulated the following test of significance:

- Model 1:
    - H0: gov_respond = 0
    - H1: gov_respond < 0

Elite Exploitation:

CPO12: Marginalization produced by political competition increases the risk of conflict.

In many countries undergoing state building processes, the state and its political creation process is a theater for elite competition over resource control, which hinders conflict mediation potential. This furthers societal divisions, as elites often enforce policies which further marginalize minority groups, and these differences can be exploited by different groups competing for power to further divisions. In this way, experiences of discrimination and

exclusion can be an important indicator of political competition and elite exploitation (Douma 2006).

Considering this, literature implies that in this CPO we would assume that increasing feelings of discrimination and exclusion would be positively associated with conflict, which is captured by analyzing the relationship of *comm_discrimination* with *conflict* and *injury.*

Model 1:

- H0: comm_discrimination = 0
- H1: comm_discrimination > 0

Model 2

- H0: comm_discrimination = 0
- H1: comm_discrimination > 0

4. Results and Analysis

Given that the dependent variable in both models is a dummy, we ran the regression as a linear probability model. This means that these models functionally measure the change in likelihood that a participant reports a member of their household either engaging in disputes or conflicts in the past year (model 1) or change in likelihood that a participant reports a member of their household has been injured or killed due to violence and conflict in the past year (model 2).

A. Distributions

First, it is important to assess the variation within our variables to ensure sufficient variance, particularly between the dummy variables, exists.

Variable	Min.	1st Quartile	Median	Mean	3rd Quartile	Max
conflict	0	0	0	.2712	1	1
injury	0	0	0	.134	0	1
change_weather	0	1	1	.8538	1	1
lessanimals	0	0	0	.2917	1	1
gov_respond	1	3	4	3.989	4	6
comm_discrimination	0	0	0	.3929	1	1
status_hh	0	0	1	.534	1	1
move	0	0	0	.3506	1	1
femalefree	0	0	0	.1083	0	1

forc_dis_times	0	0	1	1.022	1	13
sqrtamount_income	0	8.062	10	10.082	12.247	34.641
district	0	0	0	.1724	0	1

From this, we can see most variables have sufficient variation.

While most of the variables are categorical or dummy variables, the amount_income and forc_dis_times variables are not. Therefore, we ran tests to confirm if these variables are normally distributed or not. When we view the variables on a graph, we see they are right skewed. Additionally, later Ramsey RESET tests on the models reveal nonlinear functional form misspecification. While amount_income can be transformed with square root, there is not an appropriate transformation for forc_dis_times and therefore we used robust standard errors to mitigate the impacts of non-normality within the model.

B. Models

The initial regression table outputs are captured in the table below:

	Dependent variable:	
	conflict	injury
	(1)	(2)
forc_dis_times	0.021***	0.010
	(0.007)	(0.006)
change_weather	-0.066**	-0.102***
	(0.032)	(0.028)

lessanimals	0.085***	0.039**
	(0.023)	(0.019)
gov_respond	0.003	-0.009
	(0.008)	(0.007)
comm_discrimination	0.211***	-0.003
	(0.023)	(0.020)
status_hh	-0.104***	-0.038**
	(0.021)	(0.018)
move	0.220***	0.087***
	(0.023)	(0.020)
femalefree	-0.014	-0.061**
	(0.032)	(0.027)
district	-0.287***	-0.141***
	(0.031)	(0.027)

sqrtamount_income	0.006*	0.015***
	(0.003)	(0.003)
Constant	0.152***	0.103**
	(0.058)	(0.050)
Observations	1,560	1,560
R^2	0.257	0.070
Adjusted R^2	0.252	0.064
Residual Std. Error (df = 1549)	0.384	0.330
F Statistic (df = 10; 1549)	53.649***	11.686***
Note:	*p<0.1; **p<0.05; ***p<0.01	

In this table we can see the R2 for Model 1 is .257 meaning that 25.70% of the variation in reports of a household engaging in conflict or disputes in the past year can be explained by our independent variables. In Model 2, this figure is .070 meaning 7.00% of the variation in households reporting an injury or death in the past year can be explained by the independent variables.

We will break down the results along the causal process observations below, but in the immediate term we can see that the significant variables at the 5% level in Model 1 are forc_dis_times, change_weather, lessanimals, comm_discrimination, status_hh, move, sqrtamount_income, and district. In Model 2, the significant variables at the 5% level are change_weather, lessanimals, status_hh, move, femalefree, district, and sqrtamount_income.

C. Testing

In the following section we will explore the validity or invalidity of the key assumptions behind multi-linear OLS regressions.

a. Collinearity

An examination of all independent variables reveals that there is no unreasonable high level of collinearity between them, as demonstrated in the figure below.

	forc_dis_times	injury	change_weather	lessanimals	gov_respond	comm_discrimination	conflict	status_hh	move	femalefree	district	sqrtamount_income
forc_dis_times	1.00	0.09	0.14	-0.11	0.21	0.07	0.18	-0.13	0.09	0.01	-0.29	0.11
injury	0.09	1.00	-0.02	0.01	-0.01	0.07	0.19	-0.02	0.14	-0.06	-0.13	0.16
change_weather	0.14	-0.02	1.00	0.13	0.04	-0.06	0.04	0.14	-0.09	0.07	-0.48	0.17
lessanimals	-0.11	0.01	0.13	1.00	-0.16	-0.09	0.03	0.00	-0.07	0.04	-0.04	-0.19
gov_respond	0.21	-0.01	0.04	-0.16	1.00	0.05	0.06	-0.05	0.01	-0.01	-0.14	0.04
comm_discrimination	0.07	0.07	-0.06	-0.09	0.05	1.00	0.37	-0.05	0.46	0.07	-0.07	0.07
conflict	0.18	0.19	0.04	0.03	0.06	0.37	1.00	-0.10	0.34	0.03	-0.26	0.09
status_hh	-0.13	-0.02	0.14	0.00	-0.05	-0.05	-0.10	1.00	0.06	-0.01	-0.08	0.21
move	0.09	0.14	-0.09	-0.07	0.01	0.46	0.34	0.06	1.00	0.01	0.01	0.10
femalefree	0.01	-0.06	0.07	0.04	-0.01	0.07	0.03	-0.01	0.01	1.00	-0.09	-0.10
district	-0.29	-0.13	-0.48	-0.04	-0.14	-0.07	-0.26	-0.08	0.01	-0.09	1.00	-0.22
sqrtamount_income	0.11	0.16	0.17	-0.19	0.04	0.07	0.09	0.21	0.10	-0.10	-0.22	1.00

b. Other assumptions

We utilized standard charts to evaluate the validity of the model. Overall, as a linear probability model there is an anticipation of heteroskedasticity which necessitates the use of robust standard errors. In running tests, we also determined there was some degree of non-normality which also justified transformation of the amount_income variable, which we also utilized to help address the non-linearity demonstrated in the residuals vs. fitted graph and validated with a Ramsey RESET test.

D. Analysis

Below is a table of the main findings and results from the regression analysis:

CPO	**Model**	**Hypothesis**	**Rule**	**Statistics**	**Result**
CPO3: Reduced livelihoods increases inter and intra-community conflict	Model 1 (Conflict)	H0: lessanimals = 0 H1: lessanimals > 0	Reject if t-value > c and p-value < .05	T-statistic (3.748) > 1.645, p-value significantly less than .05	Null hypothesis rejected in favor of alternate.
	Model 2 (injury)	H0: lessanimals= 0 H1: lessanimals > 0	Reject if t-value > c and p-value < .05	T-statistic (1.991) > 1.645, p-value less than .05	Null hypothesis rejected in favor of alternate.

CPO5: Changing mobility patterns result in increased inter-clan conflict	Model 1 (conflict)	H0: move = 0 H1: move > 0	Reject if t-value > c and p-value < .05	T-statistic (9.432) > 1.645, p-value significantly less than .05	Null hypothesis rejected in favor of alternate.
	Model 2 (injury)	H0: move= 0 H1: move > 0	Reject if t-value > c and p-value < .05	T-statistic (4.342) > 1.645, p-value significantly less than .05	Null hypothesis rejected in favor of alternate
CPO8: Grievances vs the "state"/"the government" increase support for armed groups	Model 1 (conflict)	H0: gov_respond = 0 H1: gov_respond < 0	Reject if t-value < c and p-value < .05	T-statistic .413 < 1.645, p-value significantly more than .05	Fail to reject null hypothesis.
CPO12: Marginalization produced by political competition increases the risk of conflict.	Model 1 (conflict)	H0: comm_discrimination = 0 H1: comm_discrimination > 0	Reject if t-statistic > c and p-value < .05	T-statistic 9.259 > 1.645, p-value significantly less than .05	Null hypothesis rejected in favor of alternate.
	Model 2 (injury)	H0: comm_discrimination = 0 H1: comm_discrimination > 0	Reject if t-statistic > c and p-value < .05	T-statistic -.176 < 1.645, p-value significantly greater than .05	Fail to reject the null hypothesis.

Below, we break down the findings by each CPO.

CPO3: Reduced livelihoods increases inter and intra-community conflict

Under this pathway, we found statistically significant evidence to affirm that a reduction in household animals over the past five years increases the likelihood of reporting a household involved in conflict or disputes in the past year - specifically, those who report losing animals in the past five years have a 8.50% greater chance of reporting household involvement in disputes or conflict. This provides some validation of this CPO. This is further validated by the second model, which shows that having less animals compared to five years ago also increases the risk of a member of the household being injured or killed due to violence or

conflict in the same year by 3.90%. This means there is a small but statistically significant relationship between livelihoods reduction and reports of conflict, disputes, death and injury.

It is worth noting that in a simple linear regression model, *lessanimals* is not statistically significant against *conflict* or *injury.* It only becomes relevant in either model when combined with another variable such as move, comm_discrimination, forc_dis_times and sqrtamount_income. In particular, *lessanimals* becomes the most significant in conjunction with *comm_discrimination. For example,* in a model with the DV conflict its coefficient moves from .00635 to .06742 when *comm_discrimination* is added, meaning that the model does not indicate the loss of livelihood itself to be related to conflict but rather it is the relationship between this loss and other significant factors, especially experiences of community discrimination, which make the relationship statistically relevant.

It is worth noting that roughly 33% of the changeanimals variable consisted of NAs, which could indicate a bias and unreliability of this result due to nonresponse. This should be noted accordingly when accounting for results within this test.

CPO5: Changing mobility patterns result in increased inter-clan conflict
Under this CPO, we confirmed that reporting a member of the household has had to move for income is positively associated with reporting household engagement in dispute or conflicts in the past year. In fact, those reporting a member of the household moved for livelihoods are 22.00% more likely to report their household engaged in violence or conflict in the past year. In addition, those reporting moving for income are also 8.70% more likely to report a member of the household being injured or killed by violent conflict in the past year.

Move is a significant variable in and of itself: in a simple regression, it is significant on conflict and on injury, with reports of moving for incoming increasing the likelihood of conflict or disputes being reported by 32.00% and likelihood of injury or death by 9.77%. However, adding other variables weakens the coefficient of *move* but not its significance. This could mean that *move* has a strong relationship with other variables that is important to its causal mechanism - particularly with *comm_discrimination*.

CPO8: Grievances vs the "state"/"the government" increase support for armed groups
Under this CPO, we fail to reject the null hypothesis. This means that perceptions of government response do not have a statistically significant influence on rates of conflict. This weakens the overall argument of this causal process observation: having a low opinion of the district government, at the least, does not seem to have a relationship with conflict dynamics. This implies that whether or not an individual approves of the services of the state does not influence their likelihood to engage in a dispute or conflict, although it does not specifically speak to their opinion of non-state armed groups or state-affiliated armed groups.

By itself, *gov_respond* is a significant variable in relation to *conflict.* However, when other variables are added it loses its significance, perhaps indicating that its impacts are better addressed by the impact of other variables in the model.

CPO12: Marginalization produced by political competition increases the risk of conflict.

Those reporting experiences of community discrimination are 21.11% more likely to report engaging in conflict or disputes in the past year. However, reporting community discrimination was not a statistically significant variable in reports of injury or death in the household in the past year. This falls in line with literature on the nature of inequality and conflict: perceptions of group discrimination or inequality may be enough to motivate engagement in conflict or violence if coupled with sufficient opportunity (Must 2016). Nonetheless, this at least validates that community discrimination, regardless of origin, has a strong and significant relationship with engagement in conflict or disputes.

From the above, we know that comm_discrimination has a particularly interesting relationship with *move* and *lessanimals.* These three variables together result in the conflict model results in an R2 of .178, and all are significant. This indicates that the mechanism through which these variables - moving for income, community discrimination, and reduction in livelihoods - link with conflict is particularly important.

5. Findings

All in all, we have evidence which provides some degree of validation, or at least fails to invalidate, three out of four CPOs tested with this model. Ultimately, we can establish that in Galmudug there is some degree of evidence which supports ***CPO3: Reduced livelihoods increases inter and intra-community conflict, CPO5: Changing mobility patterns result in increased inter-clan conflict*** and ***CPO12: Marginalization produced by political competition increases the risk of conflict*****.** This does not mean a causal relationship has been affirmed, but rather that our models do affirm there is some degree of statistically relevant relationship between these assumptions that the qualitative aspects of this research can explore.

One of the most major findings of this analysis is that there is a significant relationship between reporting moving for income, reporting community discrimination, reduction in livelihoods and conflict. In the context of Somalia, this largely has strong implications for potentially unequal impacts of climate change on different clan groups (particularly minority clans), especially when it comes to access to alternative economic opportunities and exposure to conflict, as well as implications indicating the role of elite exploitation in these processes.

6. Limitations

For a number of reasons, ascertaining causality from these models themselves was not plausible: first, the data collected occurred over one time period and was not longitudinal. Second, the phrasing of the questions themselves meant establishing timelines and relationships between variables was not possible. For example, the questions around selling animals and participating in conflict did not necessarily link the fact that someone had sold an animal and then engaged in a dispute or conflict. Lastly, the surveys were only conducted in locations impacted by climate change, thus not allowing comparison between areas without climate change impacts. This is understandable given the survey's focus on Galmudug as a state, but it does mean it is difficult to validate the results that are exclusively results of climate

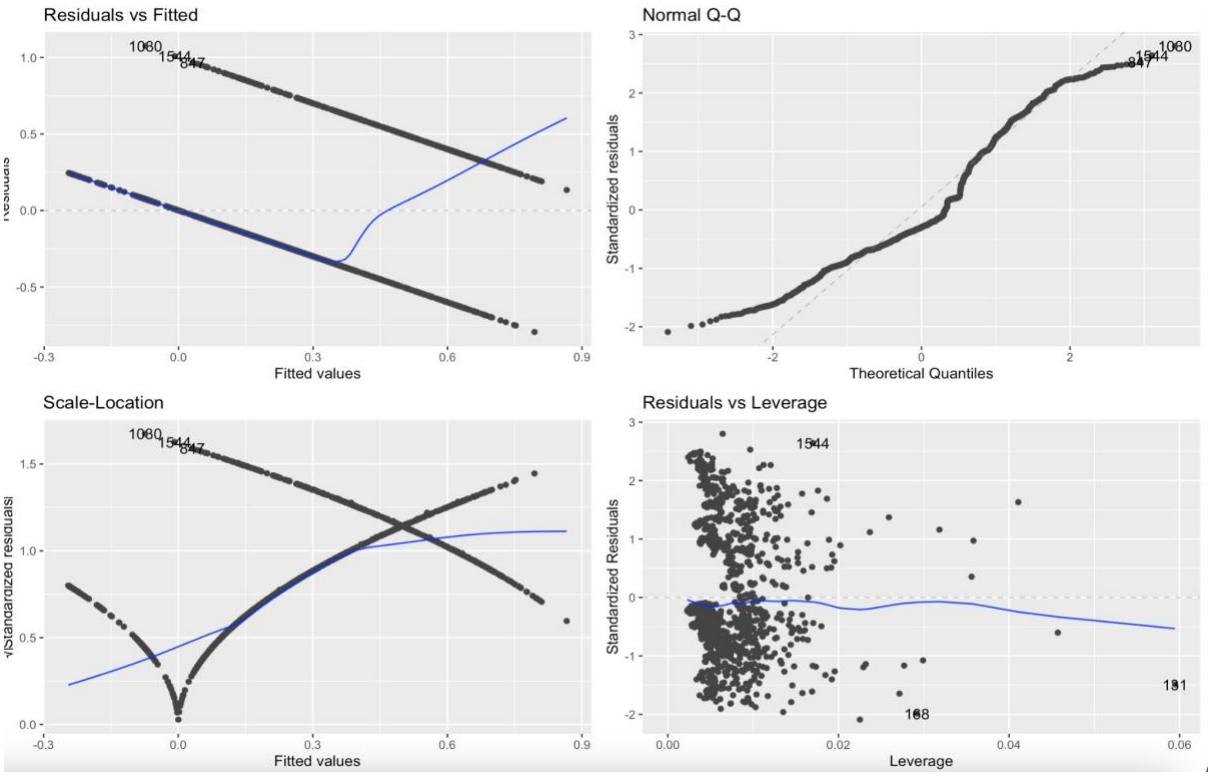
change. With additional time, it may be possible to compare these results with district profiling assessments from other areas across Somalia to add external validity. While causality is not established solely from this exercise, these findings are incorporated into the process tracing as identified above where we will utilize mixed methods to interpret the findings and their implications for the pathways between climate change and conflict in Galmudug in particular.

It is also worth noting that to an extent the analysis was restricted by lack of variation in potential independent variables. For example, only 5% of respondents were from urban areas, meaning there was not sufficient variation to run a test on the impacts of urban vs. rural respondents on the independent and dependent variables. In this way, these factors could represent endogenous variables. Generally speaking, there is some degree of anticipated endogeneity overall, as conflict is a complex occurrence in most contexts and particularly in Somalia. We can therefore expect that perhaps there is an omitted variable, and that this variable is likely related both to the dependent variable as well as some of the independent variables. This may be something like time (i.e. the occurrence of this survey during ongoing operations against al-Shabaab), as an example.

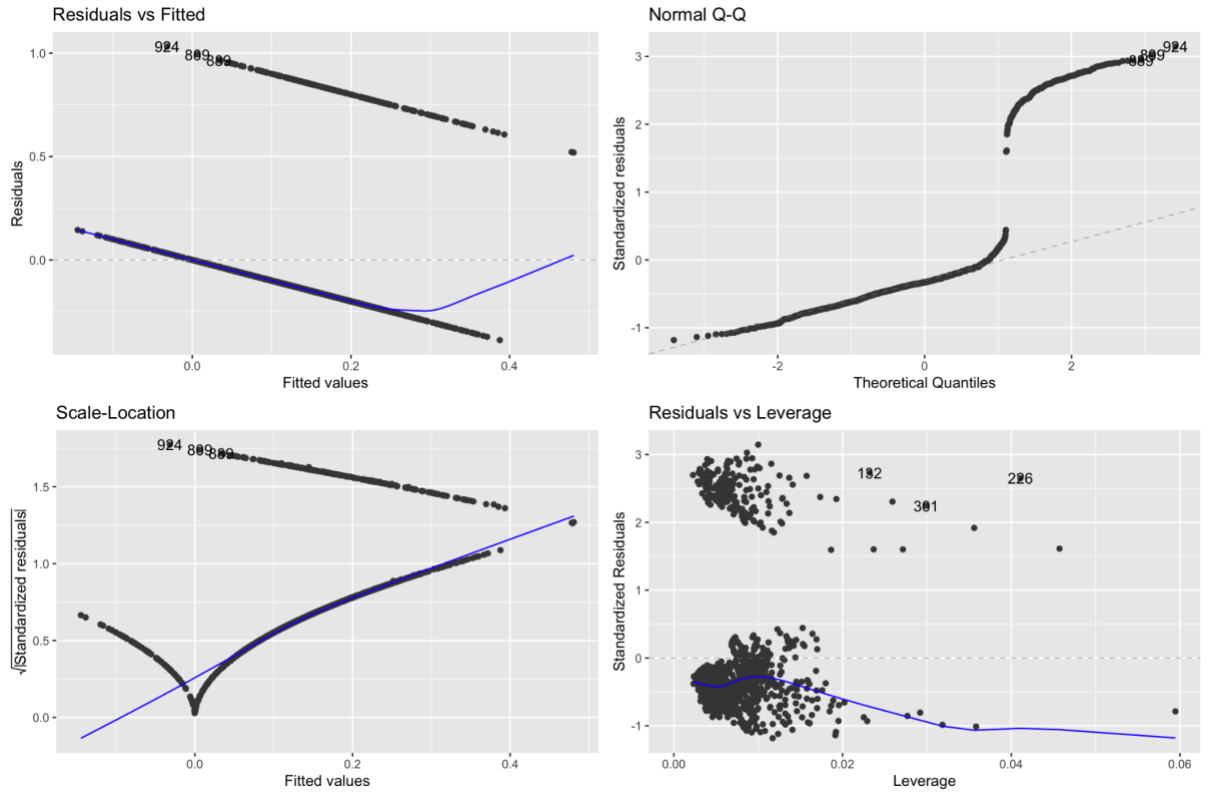
7. Additional Graphs

Below are the graphs to validate/test assumptions for the model. It should be noted for the residuals vs. fitted graph that the models are linear probability models with significant numbers of dummy variables, which impacts their linearity. In the Normal Q-Q plot, Model 1 seems to be roughly normal while Model 2 justifies the use of robust standard errors. The Scale-Location plot also indicates the presence of heteroskedasticity. Meanwhile, the residuals vs. fitted chart indicates there may be outliers that are worth additional exploration.

Model 1



Model 2



Annex B: Bibliography

'A Map of Somalia Regions'. 2018. Wikimedia Commons. https://commons.wikimedia.org/wiki/File:A_map_of_Somalia_regions.png.

Abdirashid, Elmi. 2021. '"Prospects of Food Security in Somalia under Looming Climatic Changes (November 2021) - Somalia."' *ReliefWeb, Heritage Institute*, 9 December 2021. https://reliefweb.int/report/somalia/prospects-food-security-somalia-under-looming-climatic-changes-november-2021.

Adger, W Neil, Juan M Pulhin, Jon Barnett, Geoffrey D Dabelko, Grete K Hovelsrud, Marc Levy, Úrsula Oswald Spring, et al. 2014. 'Human Security'. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 755–91. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

Arksey, Hilary, and Lisa O'Malley. 2005. 'Scoping Studies: Towards a Methodological Framework'. *International Journal of Social Research Methodology* 8 (1): 19–32. https://doi.org/10.1080/1364557032000119616.

Baalen, Sebastian van, and Malin Mobjörk. 2016. 'A Coming Anarchy? Pathways from Climate Change to Violent Conflict in East Africa'. Research Report. Stockholm: Stockholm University, Stockholm International Peace Research Institute, The Swedish Isntitute of Itnernational Affairs.

———. 2018. 'Climate Change and Violent Conflict in East Africa: Integrating Qualitative and Quantitative Research to Probe the Mechanisms'. *International Studies Review* 20 (4): 547–75. https://doi.org/10.1093/isr/vix043.

Barnett, Jon, and W. Neil Adger. 2007. 'Climate Change, Human Security and Violent Conflict'. *Political Geography* 26 (6): 639–55. https://doi.org/10.1016/j.polgeo.2007.03.003.

———. 2018. 'Mobile Worlds: Choice at the Intersection of Demographic and Environmental Change'. *Annual Review of Environment and Resources* 43 (1): 245–65. https://doi.org/10.1146/annurev-environ-102016-060952.

Bennett, Andrew, and Alexander L George. 1997. 'Process Tracing in Case Study Research'.

Bohnet, Heidrun, Fabien Cottier, and Simon Hug. 2018. 'Conflict-Induced IDPs and the Spread of Conflict'. *Journal of Conflict Resolution* 62 (4): 691–716. https://doi.org/10.1177/0022002716665209.

Broek, Emilie, and Christophe M. Hodder. 2022. 'Towards an Integrated Approach to Climate Security and Peacebuilding in Somalia'. Stockholm International Peace Research Institute. https://doi.org/10.55163/TUAI7810.

Brzoska, Michael, and Christiane Fröhlich. 2016. 'Climate Change, Migration and Violent Conflict: Vulnerabilities, Pathways and Adaptation Strategies'. *Migration and Development* 5 (2): 190–210. https://doi.org/10.1080/21632324.2015.1022973.

Buhaug, Halvard, and Jonas Vestby. 2019. 'On Growth Projections in the Shared Socioeconomic Pathways'. *Global Environmental Politics* 19 (4): 118–32. https://doi.org/10.1162/glep_a_00525.

Burrows, Kate, and Patrick Kinney. 2016. 'Exploring the Climate Change, Migration and Conflict Nexus'. *International Journal of Environmental Research and Public Health* 13 (4): 443. https://doi.org/10.3390/ijerph13040443.

Caus, Jessica. 2021. 'Climate-Driven Recruitment into Armed Groups in Nigeria'. United Nations University.

Chersich, M F, C P Swift, I Edelstein, G Breetzke, F Scorgie, F Schutte, and C Y Wright. 2019. 'Violence in Hot Weather: Will Climate Change Exacerbate Rates of Violence in South Africa?' *South African Medical Journal* 109 (7): 447. https://doi.org/10.7196/SAMJ.2019.v109i7.14134.

ChildFund. 2017. 'Ten Facts You Need to Know about the Africa Food Crisis."', 5 December 2017.

Cortés Ferrandez, Pablo. 2020. '"NO LAND, NO WATER, NO PASTURE" The Urbanisation of Drought Displacement in Somalia'. No Matter of Choice: Displacement in a Changing Climate. Internal Displacement Monitoring Centre (IDMC).

De Juan, Alexander. 2015. 'Long-Term Environmental Change and Geographical Patterns of Violence in Darfur, 2003–2005'. *Political Geography* 45 (March): 22–33. https://doi.org/10.1016/j.polgeo.2014.09.001.

De Juan, Alexander, and Niklas Hänze. 2021. 'Climate and Cohesion: The Effects of Droughts on Intra-Ethnic and Inter-Ethnic Trust'. *Journal of Peace Research* 58 (1): 151–67. https://doi.org/10.1177/0022343320974096.

De Juan, Alexander, and Eva Wegner. 2019. 'Social Inequality, State-Centered Grievances, and Protest: Evidence from South Africa'. *Journal of Conflict Resolution* 63 (1): 31–58. https://doi.org/10.1177/0022002717723136.

Detges, Adrien. 2014. 'Close-up on Renewable Resources and Armed Conflict'. *Political Geography* 42 (September): 57–65. https://doi.org/10.1016/j.polgeo.2014.06.003.

Douma, Pyt. 2006. 'Poverty, Relative Deprivation and Political Exclusion as Drivers of Violent Conflict in Sub Saharan Africa'. *Journal on Sciences and World Affairs* 2 (2): 59–69.

Eklöw, Karolina, and Dr Florian Krampe. 2019. 'Climate-Related Security Risks and Peacebuilding in Somali', October.

Ember, Carol R. Ian Skoggard, Teferi Abate Adem, and A.J. Faas. 2014. 'Rain and Raids Revisited: Disaggregating Ethnic Group Livestock Raiding in the Ethiopian-Kenyan Border Region'. *Civil Wars* 16 (3): 300–327. https://doi.org/10.1080/13698249.2014.966430.

Eriksen, Siri, and Jeremy Lind. 2009. 'Adaptation as a Political Process: Adjusting to Drought and Conflict in Kenya's Drylands'. *Environmental Management* 43 (5): 817–35. https://doi.org/10.1007/s00267-008-9189-0.

FSNAU. 2022. 'Multi-Partner Technical Release on Updated IPC Analysis for Somalia for October 2022 to June 2023'. FSNAU. 13 December 2022. https://fsnau.org/downloads/Multi-Partner-Technical-Release-on-Updated-IPC-Analysis-for-Somalia-fo-October-2022-to-June-2023-Final-(English)-13-Dec-2022.pdf.

GIST Research Ltd. 2022. ‘Transhumance Tracking Tool Systems Setup and Support: Phase 1 Report’. GIST Research Ltd. prepared for International Organisation of Migration (IOM).

Gleditsch, Nils Petter. 2012. ‘Whither the Weather? Climate Change and Conflict’. *Journal of Peace Research* 49 (1): 3–9. https://doi.org/10.1177/0022343311431288.

Hendrix, Cullen S, and Idean Salehyan. 2012. ‘Climate Change, Rainfall, and Social Conflict in Africa’. *Journal of Peace Research* 49 (1): 35–50. https://doi.org/10.1177/0022343311426165.

Hoffmann, Roman, Barbora Šedová, and Kira Vinke. 2021. ‘Improving the Evidence Base: A Methodological Review of the Quantitative Climate Migration Literature’. *Global Environmental Change* 71 (November): 102367. https://doi.org/10.1016/j.gloenvcha.2021.102367.

Ide, Tobias, Michael Brzoska, Jonathan F. Donges, and Carl-Friedrich Schleussner. 2020. ‘Multi-Method Evidence for When and How Climate-Related Disasters Contribute to Armed Conflict Risk’. *Global Environmental Change* 62 (May): 102063. https://doi.org/10.1016/j.gloenvcha.2020.102063.

Justino, Patricia. 2009. ‘Poverty and Violent Conflict: A Micro-Level Perspective on the Causes and Duration of Warfare’. *Journal of Peace Research* 46 (3): 315–33. https://doi.org/10.1177/0022343309102655.

Khalil, James, and Martin Zeuthen. 2023. ‘The “Off-Ramp” From al-Shabaab: Disengagement During the Ongoing Offensive in Somalia’. *International Centre for Coutner Terrorism*, 7 March 2023. https://www.icct.nl/publication/ramp-al-shabaab-disengagement-during-ongoing-offensive-somalia.

Koubi, Vally. 2019. ‘Climate Change and Conflict’.

Krampe, Eklöw. 2019. ‘“Climate-Related Security Risks and Peacebuilding in Somalia”.’ *SIPRI*, 2019. https://sipri.org/sites/default/files/2019-10/sipripp53_2.pdf.

Krampe, Florian. 2017. ‘Risk, But Also Opportunity in Climate Fragility and Terror Link’. NewSecurityBeat - the Blog of the Environmental Change and Security Program. 17 May 2017. https://www.newsecuritybeat.org/2017/05/risk-opportunity-climate-fragility-terrorism-link/.

Leff, Jonah. 2009. ‘Pastoralists at War: Violence and Security in the Kenya-Sudan-Uganda Border Region’ 3.

Lwanga-Ntale, Charles, and Boniface O. Owino. 2020. ‘Understanding Vulnerability and Resilience in Somalia’. *Jàmbá Journal of Disaster Risk Studies* 12 (1). https://doi.org/10.4102/jamba.v12i1.856.

Mach, Katharine J., Caroline M. Kraan, W. Neil Adger, Halvard Buhaug, Marshall Burke, James D. Fearon, Christopher B. Field, et al. 2019. ‘Climate as a Risk Factor for Armed Conflict’. *Nature* 571 (7764): 193–97. https://doi.org/10.1038/s41586-019-1300-6.

Majid, Nisar, and Stephen McDowell. 2012. ‘Hidden Dimensions of the Somalia Famine’. *Global Food Security* 1 (1): 36–42. https://doi.org/10.1016/j.gfs.2012.07.003.

Maystadt, Jean-François, and Olivier Ecker. 2014. ‘Extreme Weather and Civil War: Does

Drought Fuel Conflict in Somalia through Livestock Price Shocks?' *American Journal of Agricultural Economics* 96 (4): 1157–82. https://doi.org/10.1093/ajae/aau010.

Mobjörk, Dr Malin, Dr Florian Krampe, and Kheira Tarif. 2020. 'Pathways of Climate Insecurity: Guidance for Policymakers', November.

Must, Elise. 2016. 'When and How Does Inequality Cause Conflict? Group Dynamics, Perceptions and Natural Resources'. London, UK: London School of Economics.

Nett, Katharina, and Lukas Rüttinger. 2016. 'Insurgency, Terrorism and Organised Crime in a Warming Climate'. Berlin: Climate Diplomacy.

Omolo, Na. 2011. 'Gender and Climate Change-Induced Conflict in Pastoral Communities: Case Study of Turkana in Northwestern Kenya'. *African Journal on Conflict Resolution* 10 (2). https://doi.org/10.4314/ajcr.v10i2.63312.

Raleigh, Clionadh, Lisa Jordan, and Idean Salehyan. 2008. 'Assessing the Impact of Climate Change on Migration and Conflict'.

Raleigh, Clionadh, and Dominic Kniveton. 2012. 'Come Rain or Shine: An Analysis of Conflict and Climate Variability in East Africa'. *Journal of Peace Research* 49 (1): 51–64. https://doi.org/10.1177/0022343311427754.

Reuveny, Rafael. 2007. 'Climate Change-Induced Migration and Violent Conflict'. *Political Geography* 26 (6): 656–73. https://doi.org/10.1016/j.polgeo.2007.05.001.

Rigaud, Kanta Kumari, Alex de Sherbinin, Bryan Jones, Jonas Bergmann, Viviane Clement, Kayly Ober, Jacob Schewe, et al. 2018. 'Groundswell: Preparing for Internal Climate Migration'. Washington: The World Bank.

Scheffran, Jürgen. 2012. 'Migration as a Contribution to Resilience and Innovation in Climate Adaptation: Social Networks and Co-Development in Northwest Africa'. *Applied Geography*.

Scheffran, Jürgen, Peter Michael Link, and Janpeter Schilling. 2019. 'Climate and Conflict in Africa'. In *Oxford Research Encyclopedia of Climate Science*, by Jürgen Scheffran, Peter Michael Link, and Janpeter Schilling. Oxford University Press. https://doi.org/10.1093/acrefore/9780190228620.013.557.

Schilling, Janpeter, Francis EO Opiyo, and Jürgen Scheffran. 2012. 'Raiding Pastoral Livelihoods: Motives and Effects of Violent Conflict in North-Western Kenya'. *Pastoralism: Research, Policy and Practice* 2 (1): 25. https://doi.org/10.1186/2041-7136-2-25.

Sheikh, Abass Kassim. 2017. 'Conflict Assessment Report'. Berghof Foundation.

Sheikh, Abass Kassim, Janel B Galvanek, and Pascal Grimm. 2019. 'Conflict Assessment, Galmudug State'. Berghof Foundation.

SIPRI, and NUPI. 2022. 'Climate, Peace and Security Fact Sheet Somalia*'. Stockholm International Peace Research Institute, Norwegian Institute of International Affairs.

Telford, Andrew. 2020. 'A Climate Terrorism Assemblage? Exploring the Politics of Climate Change-Terrorism-Radicalisation Relations'. *Political Geography* 79 (May): 102150. https://doi.org/10.1016/j.polgeo.2020.102150.

Thalheimer, Lisa, and Christian Webersik. 2020. ‘Climate Change, Conflicts and Migration’. In *Environmental Conflicts, Migration and Governance*, edited by Tim Krieger, Diana Panke, and Michael Pregernig, 1st ed., 59–82. Bristol University Press. https://doi.org/10.46692/9781529202175.004.

Theisen, Ole Magnus. 2012. ‘Climate Clashes? Weather Variability, Land Pressure, and Organized Violence in Kenya, 1989–2004’. *Journal of Peace Research* 49 (1): 81–96. https://doi.org/10.1177/0022343311425842.

Theisen, Ole Magnus, Nils Petter Gleditsch, and Halvard Buhaug. 2013. ‘Is Climate Change a Driver of Armed Conflict?’ *Climatic Change* 117 (3): 613–25. https://doi.org/10.1007/s10584-012-0649-4.

Uexkull, Nina von, and Therese Pettersson. 2018. ‘Issues and Actors in African Nonstate Conflicts: A New Data Set’. *International Interactions* 44 (5): 953–68. https://doi.org/10.1080/03050629.2018.1493478.

UNHCR, and Norwegian Refugee Council. 2022. ‘Living in Fear: Conflict-Induced Displacements in Somalia, Protectio, Gaps, Risks and Needs’. UNHCR, NRC. https://reliefweb.int/report/somalia/briefing-paper-living-fear-conflict-induced-displacements-somalia-protection-gaps-risks-and-needs.

United Nations. 2021. ‘People, Countries Impacted by Climate Change Also Vulnerable to Terrorist Recruitment, Violence, Speakers Tell Security Council in Open Debate’, 9 December 2021. https://press.un.org/en/2021/sc14728.doc.htm.

UNOCHA. 2023. ‘HUMANITARIAN NEEDS OVERVIEW 2023 SOMALIA’. O.

Wischnath, Gerdis, and Halvard Buhaug. 2014. ‘On Climate Variability and Civil War in Asia’. *Climatic Change* 122 (4): 709–21. https://doi.org/10.1007/s10584-013-1004-0.

Annex C: Scoping Study

Abdulahi Ali, Uweis. April 2'22. 'Youth Unemployment and Security In Somalia:Prioritizing Jobs For Achieving Stability'. Heritage Institute.

Abebe, Workneh. 2021. 'Food Insecurity in the Horn of Africa and Its Impact on Peace in the Region'. IPSS Policy Brief 15 (02).

'Addressing the Double-Crisis of Locusts and COVID-19 in the Greater Horn of Africa'. 2020. Regional Desert Locust Alliance.

Ali, Jihan, Rhoda Mwasigwa, and MIchael Sitawa. 2022. 'Climate Change and Conflict in the Horn of Africa: A Gendered Perspective'. Africa Amani Journal 9 (1).

Asia M., Yusuf, and Omondi Roselyne. 2023. 'Climate Change Mitigation in Kenya, Somalia, Ethiopia: Climate Diplomacy Will Foster "Pan-Africanism for Climate Action"'. Horn Institute for Strategic Studies, 17 January 2023. https://horninstitute.org/climate-change-mitigation-in-kenya-somalia-ethiopia-tripartite-climate-diplomacy-will-foster-pan-africanism-for-climate-action/.

Aynte, Abdi, Eugene Chen, and David Mozersky. 2022. 'POWERING AHEAD: The United Nations and Somalia's Renewable Energy Opportunity'. The Stimson Center. https://www.stimson.org/wp-content/uploads/2022/03/PoweringPeaceSomaliaFinalMarch2022.pdf.

Azadi, Hossein, Stefan Burkart, Saghi Movahhed Moghaddam, Hossein Mahmoudi, Kristina Janečková, Petr Sklenička, Peter Ho, Dereje Teklemariam, and Halil Nadiri. 2022. 'Famine in the Horn of Africa: Understanding Institutional Arrangements in Land Tenure Systems'. Food Reviews International 38 (sup1): 829–45. https://doi.org/10.1080/87559129.2021.1888974.

Barrow, Ibrahim Hassan. 2020. 'Inter-Clan Conflicts in Somalia: When Peace Happen (Case Study Baidoa District, Bay Region)'. International Journal of Human Resource Studies, 16 September 2020.

Cater, Charles. 2021. 'Toward New Policies for the Climate Change and Violent Extremism Nexus in Africa |'. United Nations Development Programme. https://www.undp.org/africa/publications/toward-new-policies-climate-change-and-violent-extremism-nexus-africa.

Elmi, Abdirashid. 2021. 'PROSPECTS OF FOOD SECURITY IN SOMALIA UNDER LOOMING CLIMATIC CHANGES'. Heritage Institute.

FAO. 2022. 'Strengthening the Resilience of Rural Communities through Conflict-Sensitive Programmin', 2022. https://www.fao.org/3/cb8127en/cb8127en.pdf.

———. 2023. 'South Sudan at Glance', 2023. https://www.fao.org/south-sudan/fao-in-south-sudan/south-sudan-at-a-glance/en/.

Gebremichael, Belets, Shishay Girmay, and Mu'uz Gebru. 2019. 'Camel Milk Production and Marketing: Pastoral Areas of Afar, Ethiopia'. Pastoralism 9 (1): 16. https://doi.org/10.1186/s13570-019-0147-7.

Hagmann, Tobias. 2021. 'Trade, Taxes and Tensions in the Somali Borderlands'. Rift Valley Institute.

Hall, Samuel. 2021. ‘Identifying Climate Adaptive Solutions to Displacement in Somalia’. IOM UN Migration and UNEP, February 2021.

Heritage Institute. 2019. ‘The Galmudug Crisis: A Blueprint For Sustainable Settlement’. Heritage Institute. https://heritageinstitute.org/the-galmudug-crisis-a-blueprint-for-sustainable-settlement/publications/policy-briefs/.

———. 2022. ‘SOMALIA IS CALLING: AVERTING DROUGHT FROM BECOMING A FAMINE’. Heritage Institute. https://heritageinstitute.org/somalia-is-calling-averting-drought-from-becoming-a/publications/.

Horn Institute for Strategic Studies. 2022. ‘The 2022 Conflict Flashpoints to Watch in the Horn of Africa’, 10 February 2022. https://horninstitute.org/the-2022-conflict-flashpoints-to-watch-in-the-horn-of-africa/.

———. 2023. ‘South Sudan on the Frontline of a Climate Crisis’, 23 January 2023. https://horninstitute.org/south-sudan-on-the-frontline-of-a-climate-crisis/.

Horwood, Chris. 2020. ‘Weak Links: Challenging the Climate & Mixed Migration Paradigm in the Horn of Africa & Yemen’. Mixed Migration. https://mixedmigration.org/wp-content/uploads/2020/02/087_weak_links.pdf.

Isaac, Ombara. 2021. ‘Cross Border Natural Resource Management and Sustainable Peace in Eastern Africa Region: A Case Study of Kenya’. University of Nairobi, November.

Karamba, Wendy. 2021. Improving Access to Jobs for the Poor and Vulnerable in Somalia. World Bank. https://doi.org/10.1596/34983.

Leonard Waithaka, Edward, Waweru Kellen Wanjiku, and Mutisya David Nzioka. 2021. ‘Effects of Collaborative Management of Shared Natural Resources on Inter-State Relations in the Horn of Africa’. African Journal of Empirical Research 2 (1 & 2): 123–44. https://doi.org/10.51867/ajer.v2i2.36.

MacClinchy, Wendy. 2018. ‘What Works in UN Resident Coordinator-Led Conflict Prevention: Lessons from the Field’. United Nations University.

Mkutu, Kennedy. 2018. ‘Pastoralism and Conflict in the Horn of Africa’. Africa Peace Forum, November.

Mohamed, Abduselam Abdulahi. n.d. ‘Assessment of Conflict Dynamics in Somali National Regional State of Ethiopia’.

Mourad, Khaldoon A. 2021. ‘Post-Conflict Development, Reviewing the Water Sector in Somalia’. Environment, Development and Sustainability 25 (2): 1326–50. https://doi.org/10.1007/s10668-021-02096-3.

Owino, James. 2021. ‘Durable Solutions to Migration Challenges in East Africa and the Horn’. Institute for Security Studies (ISS).

‘Rebuilding Resilient and Sustainable Agriculture in Somalia’. 2018. World Bank; Food and Agricultural Organization of the United Nations.

Rift Valley Institute (RVI). 2021. ‘KEY ISSUES AND CHALLENGES FOR TRANSFORMATION LAND CONFLICT IN SOMALIA’. Somalia Stability Fund (SSF).

Samuel Hall. 2021. ‘Identifying Climate Adaptive Solutions to Displacement in Somalia ASSESSMENT REPORT’. IOM, UNEP. https://reliefweb.int/report/somalia/identifying-climate-adaptive-solutions-displacement-somalia-assessment-report.

Seife, T. K. 2021. ‘The Impact of Climate Change on Agriculture and Food Security in the Greater Horn of Africa’. Politikon 48 (1): 98–114. https://doi.org/10.1080/02589346.2020.1861509.

Solomon, Rahel, Belay Simane, and Benjamin F. Zaitchik. 2021. ‘The Impact of Climate Change on Agriculture Production in Ethiopia: Application of a Dynamic Computable General Equilibrium Model’. American Journal of Climate Change 10 (01): 32–50. https://doi.org/10.4236/ajcc.2021.101003.

Somali Dialogue Platform, and Somali Public Agenda. 2023. ‘Hirshabelle’s Political Settlement - Opportunities for Meaningful and Inclusive Political Processes’. Somali Dialogue.

Somali Public Agenda, and Interpeace. 2021. ‘Galmudug Reconciliation: Processes, Challenges, and Opportunities Ahead’.

Tegebu, Fredu Nega. 2020. ‘Climate Change-Induced Migration in the Horn of Africa’. South Africa Institute of International Affairs, May.

UNEP. 2023. ‘In Sudan, Conflict and Environmental Decline Go Hand in Hand’, 4 November 2023. https://www.unep.org/news-and-stories/story/sudan-conflict-and-environmental-decline-go-hand-hand.

United Nations Development Programme. 2022. ‘Promise, Peril and Resilience: Voices of Agropastoralists in Africa’s Borderland Regions | United Nations Development Programme’. United Nations Development Programme. https://www.undp.org/africa/publications/promise-peril-and-resilience-voices-agropastoralists-africas-borderland-regions.

‘WATER SECURITY IN THE GREATER HORN OF AFRICA: Addressing the Challenges’. 2021. African Development Bank.

Wepundi, Manasseh, and Roba D Sharamo. 2021. ‘The State of Peace and Security in East Africa’. Institute for Security Studies (ISS).

Zyl, Isel van, and Maram Mahdi. 2019. ‘Preventing Violent Extremism in East Africa: Lessons from Kenya, Somalia, Tanzania and Uganda’. Institute for Security Studies (ISS).